AMERICAN TOWER®
CORPORATION

# Structural Analysis Report

| | | |
|---|---|---|
| **Structure** | : | **148 ft Monopole** |
| **ATC Site Name** | : | **SMFR - North, CT** |
| **ATC Site Number** | : | **302515** |
| **Engineering Number** | : | **OAA687796_C3_02** |
| **Proposed Carrier** | : | **T-Mobile** |
| **Carrier Site Name** | : | **Stamford/MP Exit 35-36** |
| **Carrier Site Number** | : | **CT11373A** |
| **Site Location** | : | **0 Lot 4 Eastover Road**<br>**Stamford, CT 06905-1403**<br>**41.112750,-73.538353** |
| **County** | : | **Fairfield** |
| **Date** | : | **November 3, 2016** |
| **Max Usage** | : | **68%** |
| **Result** | : | **Pass** |

Reviewed by:
William Garrett, PE
Chief Engineer

STATE OF CONNECTICUT
WILLIAM GARRETT
No. 23235
LICENSED
PROFESSIONAL ENGINEER

Prepared By:
Travis J. Gatling
Structural Engineer I

Travis J. Gatling

Reviewed By:

Nov 4 2016 3:42 PM

cosign

**COA: PEC.0001553**

**Table of Contents**

Introduction ..... 1

Supporting Documents ..... 1

Analysis ..... 1

Conclusion ..... 1

Existing and Reserved Equipment ..... 2

Equipment to be Removed ..... 2

Proposed Equipment ..... 2

Structure Usages ..... 3

Foundations ..... 3

Deflection, Twist, and Sway ..... 3

Standard Conditions ..... 4

Calculations ..... Attached

## Introduction

The purpose of this report is to summarize results of a structural analysis performed on the 148 ft monopole to reflect the change in loading by T-Mobile.

## Supporting Documents

| | |
|---|---|
| **Tower Drawings** | Engineered Endeavors Job #5591, dated November 22, 1999 |
| **Foundation Drawing** | Engineered Endeavors Job #5591, dated November 17, 1999 |
| **Geotechnical Report** | Dr. Clarence Welti, dated October 25, 2000 |
| **Modifications** | ATC Project #43868633, dated September 1, 2009<br>ATC Project #51772939, dated April 11, 2013 |

## Analysis

The tower was analyzed using American Tower Corporation's tower analysis software. This program considers an elastic three-dimensional model and second-order effects per ANSI/TIA-222.

| | |
|---|---|
| **Basic Wind Speed:** | 93 mph (3-Second Gust $V_{ASD}$) / 120 mph (3-Second Gust $V_{ULT}$) |
| **Basic Wind Speed w/ Ice:** | 50 mph (3-Second Gust) w/ 3/4" radial ice concurrent |
| **Code:** | ANSI/TIA-222-G / 2012 IBC / 2016 Connecticut State Building Code |
| **Structure Class:** | II |
| **Exposure Category:** | B |
| **Topographic Category:** | 1 |
| **Crest Height:** | 0 ft |
| **Spectral Response:** | Ss = 0.25, $S_1$ = 0.07 |
| **Site Class:** | D - Stiff Soil |

## Conclusion

Based on the analysis results, the structure meets the requirements per the applicable codes listed above. The tower and foundation can support the equipment as described in this report.

If you have any questions or require additional information, please contact American Tower via email at Engineering@americantower.com. Please include the American Tower site name, site number, and engineering number in the subject line for any questions.

## Existing and Reserved Equipment

| Elevation[1] (ft) Mount | Elevation[1] (ft) RAD | Qty | Antenna | Mount Type | Lines | Carrier |
|---|---|---|---|---|---|---|
| 159.0 | 161.0 | 3 | Andrew E15S09P94 | Flush | (12) 1 5/8" Coax | T-Mobile |
| | | 3 | RFS ATMAP1412D-1A20 | | | |
| 151.0 | 151.0 | 12 | Powerwave LGP21401 | Platform w/ Handrails | (12) 1 1/4" Coax<br>(4) 0.78" 8 AWG 6<br>(2) 0.39" Fiber Trunk<br>(2) 0.74" 8 AWG 7<br>(1) 3" Conduit | AT&T Mobility |
| | | 2 | Raycap DC6-48-60-18-8F | | | |
| | | 3 | Ericsson RRUS 11 (Band 12) (55 lb) | | | |
| | | 3 | Ericsson RRUS 32 | | | |
| | | 3 | Ericsson RRUS 32 B2 | | | |
| | | 3 | Powerwave 7770.00 | | | |
| | | 3 | Quintel QS66512-2 | | | |
| | | 3 | CCI OPA-65R-LCUU-H6 | | | |
| 141.0 | 142.0 | 6 | RFS FD9R6004 | Low Profile Platform | (12) 1 5/8" Coax<br>(1) 1 5/8" Hybriflex | Verizon |
| | | 3 | Alcatel-Lucent RRH2x40-AWS | | | |
| | | 3 | Antel BXA-171063/8CF | | | |
| | | 3 | Rymsa MGD3-800T0 | | | |
| | | 1 | RFS DB-T1-6Z-8AB-0Z | | | |
| | | 1 | Antel BXA-80063-6BF-EDIN-X | | | |
| | | 1 | Antel BXA-70063/6CF __ 2° | | | |
| | | 3 | Antel BXA-70063/6CF (5" Depth) | | | |
| | | 1 | Antel BXA-80080/6CF | | | |
| 138.0 | 138.0 | 1 | DragonWave Horizon Compact | Side Arms | (6) 5/16" (0.31") Coax<br>(1) 1/2" Coax | Clearwire |
| | | 3 | NextNet BTS-2500 | | | |
| | | 3 | Argus LLPX310R | | | |
| | | 1 | DragonWave A-ANT-18G-2.5-C | | | |
| 132.0 | 132.0 | 3 | KMW KMDAPS2040000 (E-F Band) | Low Profile Platform | (9) 1 1/4" Coax<br>(6) 1 5/8" Coax | Sprint Nextel |
| | | 3 | KMW AM-X-WM-17-65-00T (48") | | | |
| | | 9 | Decibel DB844H90E-XY | | | |
| 121.0 | 121.0 | 3 | Alcatel-Lucent 800MHz 2X50W RRH w/ Filter | Low Profile Platform | (4) 1 1/4" Hybriflex | |
| | | 3 | Alcatel-Lucent 4x40W RRH (91 lb) | | | |
| | | 3 | Alcatel-Lucent TD-RRH8x20-25 w/ Solar Shield | | | |
| | | 3 | RFS APXVTM14-C-I20 | | | |
| | | 3 | RFS APXVSPP18-C-A20 | | | |
| 110.0 | 110.0 | 2 | Diamond X50A | Side Arms | (2) 1/2" Coax | Senet |
| 100.0 | 105.0 | 1 | Antel BCD-87010 ___ 4° | Side Arm | (1) 7/8" Coax | Sensus USA |
| 76.0 | 76.0 | 1 | PCTEL GPS-TMG-HR-26N | Side Arm | (1) 1/2" Coax | Sprint Nextel |

## Equipment to be Removed

| Elevation[1] (ft) Mount | Elevation[1] (ft) RAD | Qty | Antenna | Mount Type | Lines | Carrier |
|---|---|---|---|---|---|---|
| 160.0 | 160.0 | 1 | Andrew TMZXXX-6516-R2M | - | (12) 1 5/8" Coax | T-Mobile |
| | | 2 | Andrew ADFD1820-9090B-R2DM | | | |

## Proposed Equipment

| Elevation[1] (ft) | | Qty | Antenna | Mount Type | Lines | Carrier |
|---|---|---|---|---|---|---|
| Mount | RAD | | | | | |
| 159.0 | 159.0 | 3 | Commscope ATSBT-TOP-MF-4G | Flush | (6) 1 5/8" Coax | T-Mobile |
| | | 3 | Andrew SBNHH-1D65B | | | |

**[1]Mount elevation is defined as height above bottom of steel structure to the bottom of mount, RAD elevation is defined as center of antenna above ground level (AGL).**

Install proposed coax inside the pole shaft.

## Structure Usages

| Structural Component | Controlling Usage | Pass/Fail |
|---|---|---|
| Anchor Bolts | 43% | Pass |
| Shaft | 46% | Pass |
| Base Plate | 22% | Pass |
| Reinforcement | 54% | Pass |

## Foundations

| Reaction Component | Analysis Reactions | % of Usage |
|---|---|---|
| Moment (Kips-Ft) | 2,852.1 | 63% |
| Axial (Kips) | 100.6 | 7% |
| Shear (Kips) | 24.5 | 68% |

The structure foundation was found to be inadequate through analysis based on geotechnical and foundation information. Modification or reinforcement of the foundation will be required.

## Deflection and Sway*

| Antenna Elevation (ft) | Antenna | Carrier | Deflection (ft) | Sway (Rotation) (°) |
|---|---|---|---|---|
| 159.0 | Commscope ATSBT-TOP-MF-4G | T-Mobile | 0.000 | 0.000 |
| | Andrew SBNHH-1D65B | | | |
| 138.0 | DragonWave A-ANT-18G-2.5-C | Clearwire | 1.302 | 1.093 |

***Deflection and Sway was evaluated considering a design wind speed of 60 mph (3-Second Gust) per ANSI/TIA-222-G**

AMERICAN TOWER®
CORPORATION

**Standard Conditions**

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessary limited, to:

-- Information supplied by the client regarding the structure itself, antenna, mounts and feed line loading on the structure and its components, or other relevant information.

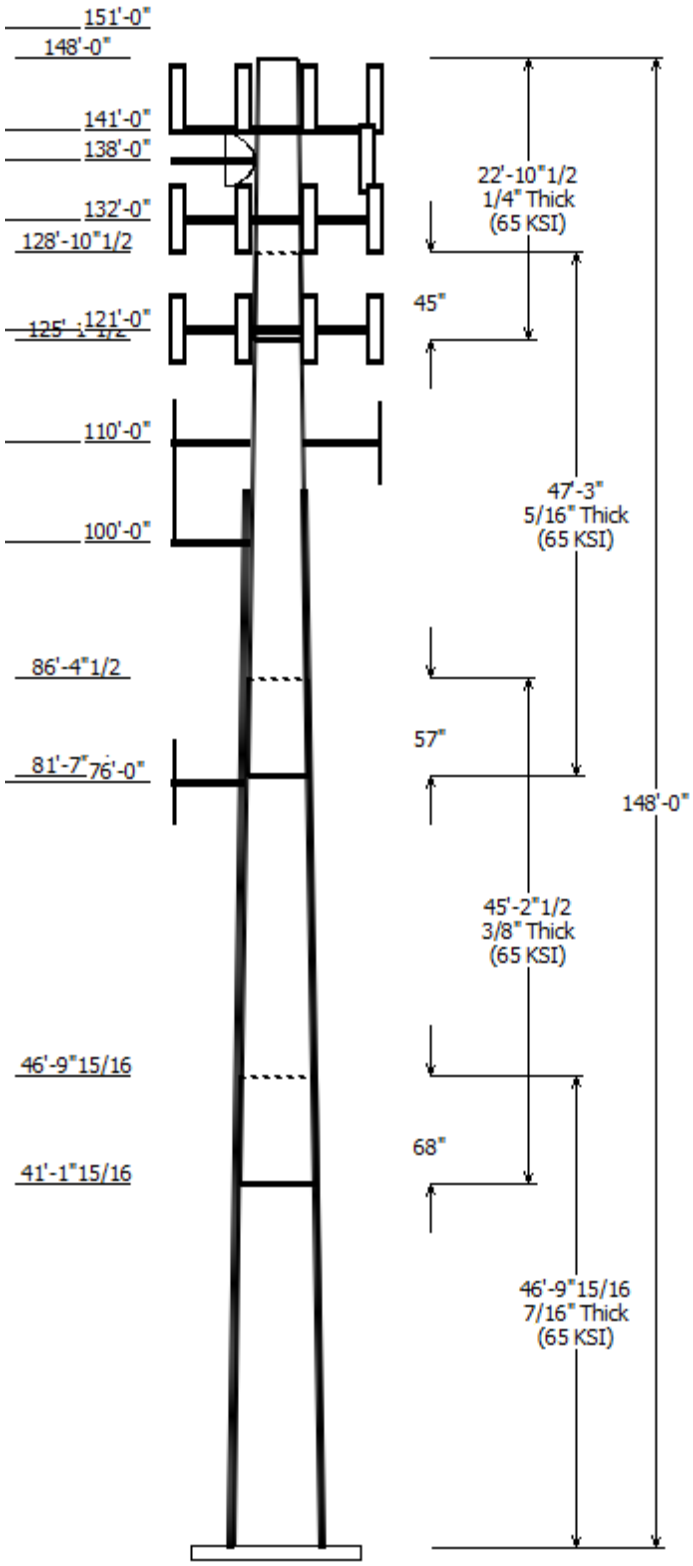
-- Information from drawings in the possession of American Tower Corporation, or generated by field inspections or measurements of the structure.

It is the responsibility of the client to ensure that the information provided to A.T. Engineering Service, PLLC and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and that their capacity has not significantly changed from the "as new" condition.

Unless explicitly agreed by both the client and American Tower Corporation, all services will be performed in accordance with the current revision of ANSI/TIA -222. The design basic wind speed will be determined based on the minimum basic wind speed as prescribed in ANSI/TIA-222. Although every effort is taken to ensure that the loading considered is adequate to meet the requirements of all applicable regulatory entities, we can provide no assurance to meet any other local and state codes or requirements. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement.

All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. A.T. Engineering Service, PLLC is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

© 2007 - 2016 by ATC IP LLC. All rights reserved.




## Job Information

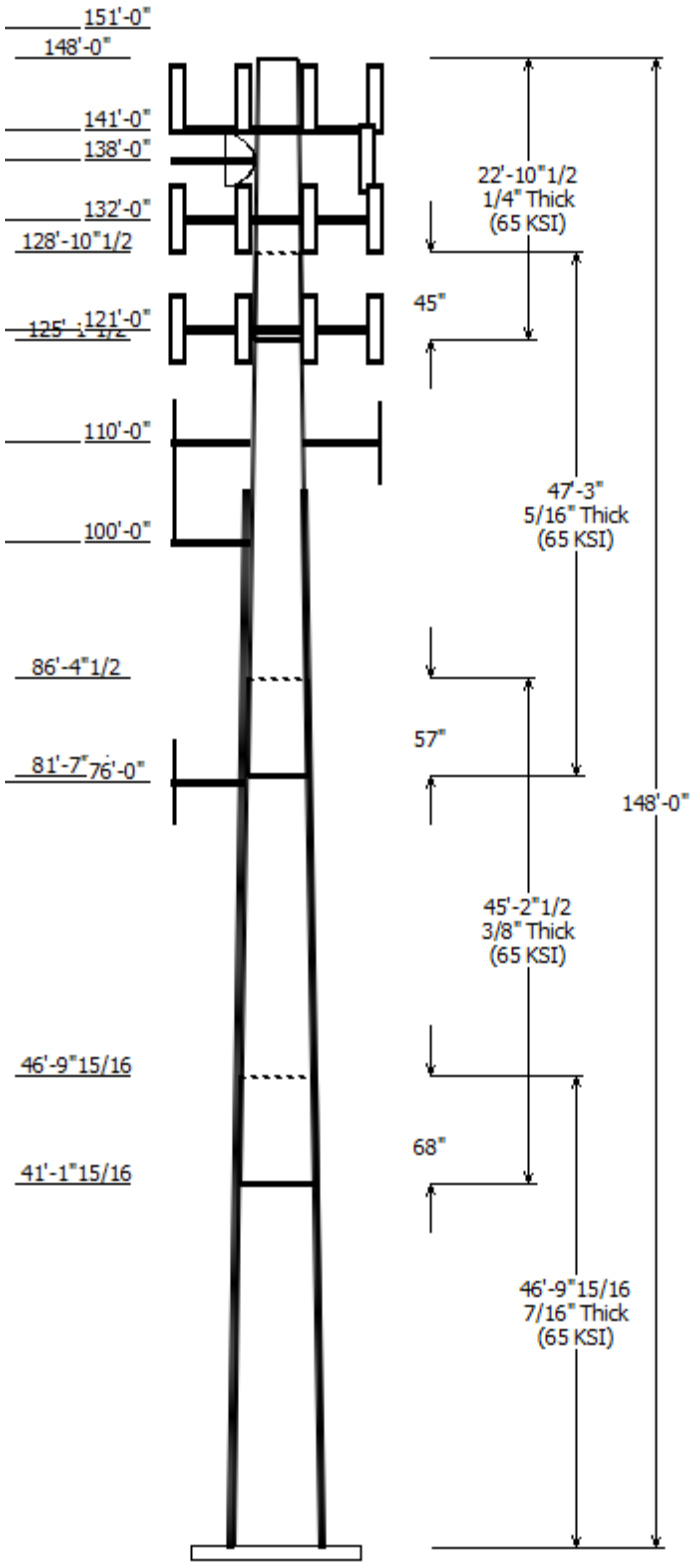
| | | | |
|---|---|---|---|
| Pole : | 302515 | Code: | ANSI/TIA-222-G |
| Description : | 148 ft EEI Monopole | | |
| Client : | T-Mobile | Struct Class : | II |
| Location : | SMFR - North, CT | | |
| Shape : | 18 Sides | Exposure : | B |
| Height : | 148.00 (ft) | Topo : | 1 |
| Base Elev (ft): | 0.00 | | |
| Taper: | 0.195101 (in/ft) | | |

## Sections Properties

| Shaft Section | Length (ft) | Diameter (in) Accross Flats Top | Bottom | Thick (in) | Joint Type | Overlap Length (in) | Taper (in/ft) | Steel Grade (ksi) |
|---|---|---|---|---|---|---|---|---|
| 1 | 46.830 | 38.86 | 48.00 | 0.438 | | 0.000 | 0.195100 | 65 |
| 2 | 45.210 | 31.89 | 40.71 | 0.375 | Slip Joint | 68.000 | 0.195100 | 65 |
| 3 | 47.250 | 24.23 | 33.45 | 0.313 | Slip Joint | 57.000 | 0.195100 | 65 |
| 4 | 22.877 | 21.00 | 25.46 | 0.250 | Slip Joint | 45.000 | 0.195100 | 65 |

## Discrete Appurtenance

| Attach Elev (ft) | Force Elev (ft) | Qty | Description |
|---|---|---|---|
| 159.000 | 161.000 | 3 | RFS ATMAP1412D-1A20 |
| 159.000 | 161.000 | 3 | Andrew E15S09P94 |
| 159.000 | 159.000 | 3 | Andrew SBNHH-1D65B |
| 159.000 | 159.000 | 3 | Commscope ATSBT-TOP-MF- |
| 151.000 | 151.000 | 1 | Flat Platform w/ Handrails |
| 151.000 | 151.000 | 3 | CCI OPA-65R-LCUU-H6 |
| 151.000 | 151.000 | 3 | Quintel QS66512-2 |
| 151.000 | 151.000 | 3 | Powerwave Allgon 7770.00 |
| 151.000 | 151.000 | 3 | Ericsson RRUS 32 B2 |
| 151.000 | 151.000 | 3 | Ericsson RRUS 32 |
| 151.000 | 151.000 | 3 | Ericsson RRUS 11 (Band 12) (55 |
| 151.000 | 151.000 | 2 | Raycap DC6-48-60-18-8F |
| 151.000 | 151.000 | 12 | Powerwave Allgon LGP21401 |
| 148.000 | 148.000 | 1 | Pipe Mount |
| 141.000 | 142.000 | 3 | Antel BXA-70063/6CF (5" Depth) |
| 141.000 | 142.000 | 3 | Rymsa MGD3-800T0 |
| 141.000 | 142.000 | 3 | Antel BXA-171063/8CF |
| 141.000 | 142.000 | 3 | Alcatel-Lucent RRH2x40-AWS |
| 141.000 | 142.000 | 1 | RFS DB-T1-6Z-8AB-0Z |
| 141.000 | 142.000 | 1 | Antel BXA-70063/6CF __ 2° |
| 141.000 | 141.000 | 1 | Flat Low Profile Platform |
| 141.000 | 142.000 | 1 | Antel BXA-80080/6CF |
| 141.000 | 142.000 | 6 | RFS FD9R6004 |
| 141.000 | 142.000 | 1 | Antel BXA-80063-6BF-EDIN-X |
| 138.000 | 138.000 | 1 | Side Arms |
| 138.000 | 138.000 | 1 | DragonWave A-ANT-18G-2.5-C |
| 138.000 | 138.000 | 3 | Argus LLPX310R |
| 138.000 | 138.000 | 3 | NextNet BTS-2500 |
| 138.000 | 138.000 | 1 | DragonWave Horizon Compact |
| 132.000 | 132.000 | 1 | Flat Low Profile Platform |
| 132.000 | 132.000 | 9 | Decibel DB844H90E-XY |
| 132.000 | 132.000 | 3 | KMW AM-X-WM-17-65-00T (48") |
| 132.000 | 132.000 | 3 | KMW KMDAPS2040000 (E-F |
| 121.000 | 121.000 | 1 | Flat Low Profile Platform |
| 121.000 | 121.000 | 3 | RFS APXVSPP18-C-A20 |
| 121.000 | 121.000 | 3 | RFS APXVTM14-C-I20 |
| 121.000 | 121.000 | 3 | Alcatel-Lucent TD-RRH8x20-25 |
| 121.000 | 121.000 | 3 | Alcatel-Lucent 4x40W RRH (91 l |
| 121.000 | 121.000 | 3 | Alcatel-Lucent 800 MHz 2X50W |
| 110.000 | 110.000 | 2 | Diamond X50A |
| 110.000 | 110.000 | 2 | Flat Side Arm |
| 100.000 | 100.000 | 1 | Flat Side Arm |
| 100.000 | 105.000 | 1 | Antel BCD-87010 ___ 4° |
| 76.000 | 76.000 | 1 | Round Side Arm |




| | | | |
|---|---|---|---|
| 76.000 | 76.000 | 1 | PCTEL GPS-TMG-HR-26N |

## Linear Appurtenance

| Elev (ft) From | To | Description | Exposed To Wind |
|---|---|---|---|
| 10.000 | 121.0 | 1 1/4" Hybriflex | Yes |
| 10.000 | 132.0 | 1 1/4" Coax | No |
| 10.000 | 132.0 | 1 5/8" Coax | No |
| 10.000 | 138.0 | 1/2" Coax | Yes |
| 10.000 | 138.0 | 5/16" (0.31", | No |
| 10.000 | 141.0 | 1 5/8" Coax | No |
| 10.000 | 141.0 | 1 5/8" Hybriflex | Yes |
| 10.000 | 151.0 | 0.39" (10mm) | No |
| 10.000 | 151.0 | 0.74" 8 (18.7mm) | No |
| 10.000 | 151.0 | 0.78" 8 (19.7mm) | No |
| 10.000 | 151.0 | 1 1/4" Coax | No |
| 10.000 | 151.0 | 3" Conduit | No |
| 10.000 | 159.0 | 1 5/8" Coax | No |
| 10.000 | 159.0 | 1 5/8" Coax | Yes |
| 10.000 | 76.000 | 1/2" Coax | Yes |
| 10.000 | 100.0 | 7/8" Coax | Yes |
| 10.000 | 110.0 | 1/2" Coax | No |
| 0.000 | 113.2 | DYWIDAG | Yes |

## Load Cases

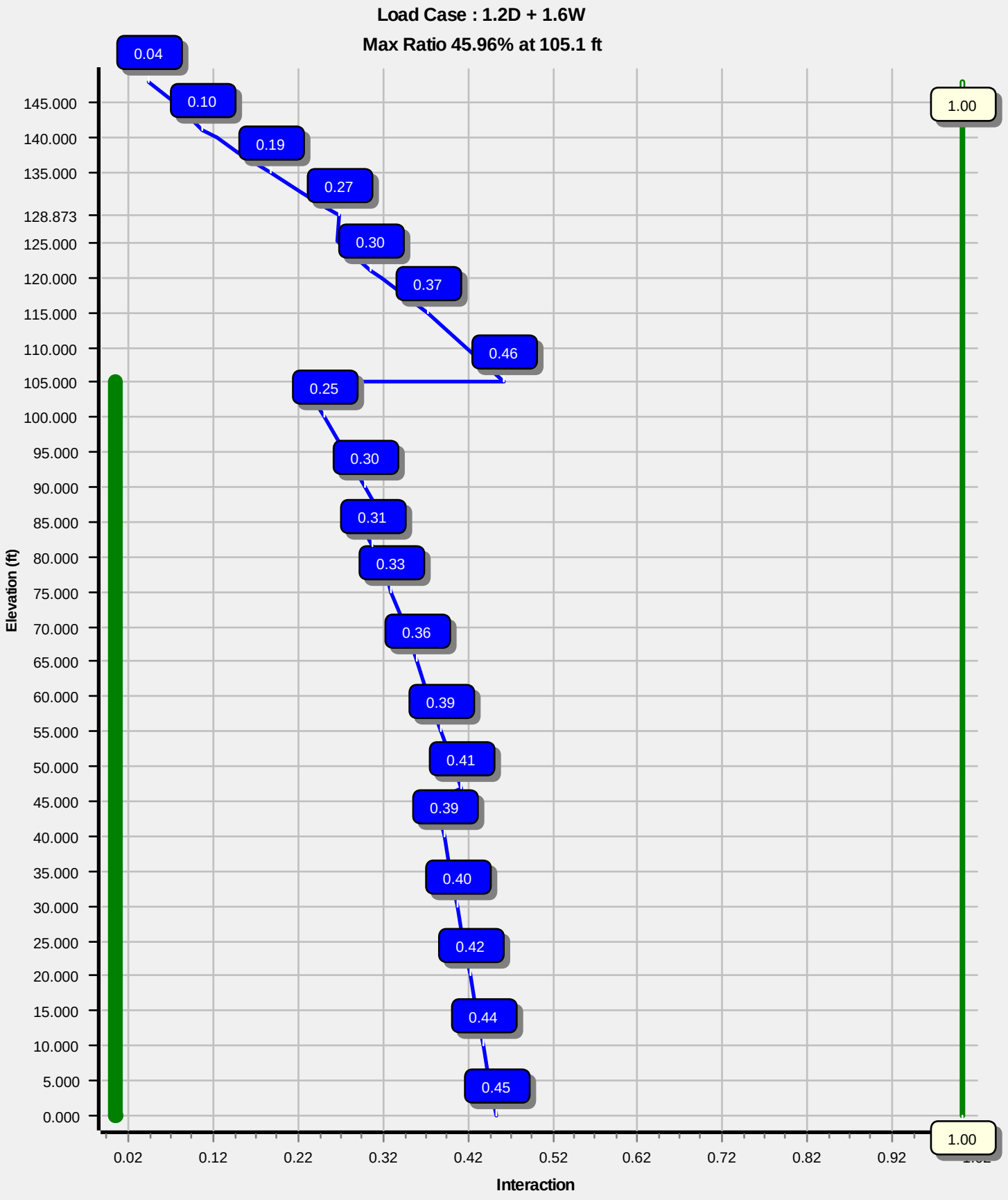
| | |
|---|---|
| 1.2D + 1.6W | 93 mph with No Ice |
| 0.9D + 1.6W | 93 mph with No Ice (Reduced DL) |
| 1.2D + 1.0Di + 1.0Wi | 50 mph with 0.75 in Radial Ice |
| (1.2 + 0.2Sds) * DL + E | Seismic Equivalent Lateral Forces Method |
| (1.2 + 0.2Sds) * DL + E | Seismic Equivalent Modal Analysis Method |
| (0.9 - 0.2Sds) * DL + E | Seismic (Reduced DL) Equivalent Lateral |
| (0.9 - 0.2Sds) * DL + E | Seismic (Reduced DL) Equivalent Modal |
| 1.0D + 1.0W | Serviceability 60 mph |

## Reactions

| Load Case | Moment (kip-ft) | Shear (kip) | Axial (kip) |
|---|---|---|---|
| 1.2D + 1.6W | 2852.09 | 24.48 | 67.06 |
| 0.9D + 1.6W | 2688.76 | 23.08 | 50.29 |
| 1.2D + 1.0Di + 1.0Wi | 795.36 | 6.83 | 100.57 |
| (1.2 + 0.2Sds) * DL + E ELFM | 202.14 | 1.80 | 63.34 |
| (1.2 + 0.2Sds) * DL + E EMAM | 273.73 | 2.89 | 63.34 |
| (0.9 - 0.2Sds) * DL + E ELFM | 199.50 | 1.80 | 42.81 |
| (0.9 - 0.2Sds) * DL + E EMAM | 269.99 | 2.89 | 42.81 |
| 1.0D + 1.0W | 702.98 | 6.00 | 55.91 |

## Dish Deflections

| Load Case | Attach Elev (ft) | Deflection (in) | Rotation (deg) |
|---|---|---|---|
| 1.0D + 1.0W | 138.00 | 15.618 | 1.093 |


Load Case : 1.2D + 1.6W
Max Ratio 45.96% at 105.1 ft
0.04
0.10
0.19
0.27
0.30
0.37
0.46
0.25
0.30
0.31
0.33
0.36
0.39
0.41
0.39
0.40
0.42
0.44
0.45
1.00
1.00
145.000
140.000
135.000
128.873
125.000
120.000
115.000
110.000
105.000
100.000
95.000
90.000
85.000
80.000
75.000
70.000
65.000
60.000
55.000
50.000
45.000
40.000
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0.000
Elevation (ft)
0.02
0.12
0.22
0.32
0.42
0.52
0.62
0.72
0.82
0.92
Interaction

| | | | |
|---|---|---|---|
| **Site Number:** | **302515** | **Code: ANSI/TIA-222-G** | © 2007 - 2016 by ATC IP LLC. All rights reserved. |
| **Site Name:** | **SMFR - North, CT** | **Engineering Number:OAA687796_C3_02** | **11/3/2016 10:23:01 AM** |
| **Customer:** | **T-Mobile** | | |

## Analysis Parameters

| | | | |
|---|---|---|---|
| **Location:** | **Fairfield County, CT** | | |
| **Code:** | **ANSI/TIA-222-G** | **Height (ft):** | **148** |
| **Shape:** | **18 Sides** | **Base Diameter (in):** | **48.00** |
| **Pole Type:** | **Taper** | **Top Diameter (in):** | **21.00** |
| **Pole Manfacturer:** | **EEI** | **Taper (in/ft) :** | **0.195** |

## Ice & Wind Parameters

| | | | |
|---|---|---|---|
| **Structure Class:** | **II** | **Design Wind Speed Without Ice:** | **93 mph** |
| **Exposure Category:** | **B** | **Design Wind Speed With Ice:** | **50 mph** |
| **Topographic Category:** | **1** | **Operational Wind Speed:** | **60 mph** |
| **Crest Height:** | **0.0 ft** | **Design Ice Thickness:** | **0.75 in** |

## Seismic Parameters

| | | | | | |
|---|---|---|---|---|---|
| **Analysis Method:** | **Equivalent Modal Analysis & Equivalent Lateral Force Methods** | | | | |
| **Site Class:** | **D - Stiff Soil** | | | | |
| **Period Based on Rayleigh Method (sec):** | | **2.43** | | | |
| **$T_L$ (sec):** | **6** | **p:** | **1.3** | **$C_s$:** | **0.030** |
| **$S_s$:** | **0.249** | **$S_1$:** | **0.069** | **$C_s$ Max:** | **0.030** |
| **$F_a$:** | **1.600** | **$F_v$:** | **2.400** | **$C_s$ Min:** | **0.030** |
| **$S_{ds}$:** | **0.266** | **$S_{d1}$:** | **0.110** | | |

## Load Cases

| | |
|---|---|
| **1.2D + 1.6W** | **93 mph with No Ice** |
| **0.9D + 1.6W** | **93 mph with No Ice (Reduced DL)** |
| **1.2D + 1.0Di + 1.0Wi** | **50 mph with 0.75 in Radial Ice** |
| **(1.2 + 0.2Sds) * DL + E ELFM** | **Seismic Equivalent Lateral Forces Method** |
| **(1.2 + 0.2Sds) * DL + E EMAM** | **Seismic Equivalent Modal Analysis Method** |
| **(0.9 - 0.2Sds) * DL + E ELFM** | **Seismic (Reduced DL) Equivalent Lateral Forces Method** |
| **(0.9 - 0.2Sds) * DL + E EMAM** | **Seismic (Reduced DL) Equivalent Modal Analysis Method** |
| **1.0D + 1.0W** | **Serviceability 60 mph** |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


## Shaft Section Properties

| Sect Info | Length (ft) | Thick (in) | Fy (ksi) | Joint Type | Slip Joint Len (in) | Weight (lb) | Bottom Dia (in) | Bottom Elev (ft) | Bottom Area (in²) | Bottom Ix (in⁴) | Bottom W/t Ratio | Bottom D/t Ratio | Top Dia (in) | Top Elev (ft) | Top Area (in²) | Top Ix (in⁴) | Top W/t Ratio | Top D/t Ratio | Taper (in/ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-18 | 46.830 | 0.4375 | 65 | | 0.00 | 9,513 | 48.00 | 0.00 | 66.04 | 18876.3 | 17.93 | 109.71 | 38.86 | 46.83 | 53.36 | 9953.9 | 14.25 | 88.83 | 0.195101 |
| 2-18 | 45.210 | 0.3750 | 65 | Slip | 68.00 | 6,579 | 40.71 | 41.16 | 48.02 | 9874.4 | 17.74 | 108.58 | 31.89 | 86.37 | 37.52 | 4710.6 | 13.59 | 85.06 | 0.195101 |
| 3-18 | 47.250 | 0.3125 | 65 | Slip | 57.00 | 4,549 | 33.45 | 81.62 | 32.87 | 4560.0 | 17.46 | 107.04 | 24.23 | 128.87 | 23.72 | 1714.9 | 12.26 | 77.54 | 0.195101 |
| 4-18 | 22.877 | 0.2500 | 65 | Slip | 45.00 | 1,420 | 25.46 | 125.12 | 20.01 | 1606.8 | 16.55 | 101.85 | 21.00 | 148.00 | 16.46 | 895.7 | 13.40 | 84.00 | 0.195101 |
| | | | | Shaft Weight | | 22,062 | | | | | | | | | | | | | |

## Discrete Appurtenance Properties

| Attach Elev (ft) | Description | Qty | No Ice Weight (lb) | No Ice EPAa (sf) | No Ice Orientation Factor | Ice Weight (lb) | Ice EPAa (sf) | Ice Orientation Factor | Distance From Face (ft) | Vert Ecc (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 159.00 | Andrew E15S09P94 | 3 | 14.60 | 0.660 | 0.50 | 38.83 | 0.914 | 0.50 | 0.000 | 2.000 |
| 159.00 | Andrew SBNHH-1D65B | 3 | 50.70 | 8.170 | 0.69 | 253.57 | 9.474 | 0.69 | 0.000 | 0.000 |
| 159.00 | Commscope ATSBT-TOP-MF- | 3 | 1.80 | 0.200 | 0.50 | 12.09 | 0.391 | 0.50 | 0.000 | 0.000 |
| 159.00 | RFS ATMAP1412D-1A20 | 3 | 13.00 | 1.000 | 0.50 | 48.06 | 1.431 | 0.50 | 0.000 | 2.000 |
| 151.00 | CCI OPA-65R-LCUU-H6 | 3 | 73.00 | 9.660 | 0.66 | 304.12 | 11.023 | 0.66 | 0.000 | 0.000 |
| 151.00 | Ericsson RRUS 11 (Band 12) | 3 | 55.00 | 2.520 | 0.50 | 135.17 | 3.163 | 0.50 | 0.000 | 0.000 |
| 151.00 | Ericsson RRUS 32 | 3 | 50.80 | 2.690 | 0.50 | 135.99 | 3.415 | 0.50 | 0.000 | 0.000 |
| 151.00 | Ericsson RRUS 32 B2 | 3 | 53.00 | 2.740 | 0.50 | 140.85 | 3.472 | 0.50 | 0.000 | 0.000 |
| 151.00 | Flat Platform w/ Handrails | 1 | 2000.00 | 42.400 | 1.00 | 3,420.72 | 63.366 | 1.00 | 0.000 | 0.000 |
| 151.00 | Powerwave Allgon 7770.00 | 3 | 35.00 | 5.510 | 0.65 | 169.69 | 6.557 | 0.65 | 0.000 | 0.000 |
| 151.00 | Powerwave Allgon LGP21401 | 12 | 14.10 | 1.100 | 0.50 | 47.64 | 1.562 | 0.50 | 0.000 | 0.000 |
| 151.00 | Quintel QS66512-2 | 3 | 111.00 | 8.130 | 0.74 | 337.65 | 9.426 | 0.74 | 0.000 | 0.000 |
| 151.00 | Raycap DC6-48-60-18-8F | 2 | 20.00 | 1.110 | 1.00 | 100.34 | 2.523 | 1.00 | 0.000 | 0.000 |
| 148.00 | Pipe Mount | 1 | 200.00 | 6.400 | 1.00 | 339.29 | 7.291 | 1.00 | 0.000 | 0.000 |
| 141.00 | Alcatel-Lucent RRH2x40-AWS | 3 | 44.00 | 2.160 | 0.67 | 116.93 | 2.800 | 0.67 | 0.000 | 1.000 |
| 141.00 | Antel BXA-171063/8CF | 3 | 10.50 | 2.900 | 0.90 | 95.07 | 3.762 | 0.90 | 0.000 | 1.000 |
| 141.00 | Antel BXA-70063/6CF (5" | 3 | 14.90 | 7.580 | 0.66 | 186.00 | 8.835 | 0.66 | 0.000 | 1.000 |
| 141.00 | Antel BXA-70063/6CF __ 2° | 1 | 17.00 | 7.570 | 0.65 | 183.28 | 8.835 | 0.65 | 0.000 | 1.000 |
| 141.00 | Antel BXA-80063-6BF-EDIN-X | 1 | 19.20 | 7.260 | 0.66 | 187.68 | 8.492 | 0.66 | 0.000 | 1.000 |
| 141.00 | Antel BXA-80080/6CF | 1 | 22.00 | 7.780 | 0.65 | 192.50 | 9.047 | 0.65 | 0.000 | 1.000 |
| 141.00 | Flat Low Profile Platform | 1 | 1500.00 | 26.100 | 1.00 | 2,144.99 | 45.106 | 1.00 | 0.000 | 0.000 |
| 141.00 | RFS DB-T1-6Z-8AB-0Z | 1 | 44.00 | 4.800 | 0.67 | 186.62 | 5.668 | 0.67 | 0.000 | 1.000 |
| 141.00 | RFS FD9R6004 | 6 | 3.10 | 0.370 | 0.50 | 5.25 | 0.627 | 0.50 | 0.000 | 1.000 |
| 141.00 | Rymsa MGD3-800T0 | 3 | 19.80 | 3.450 | 0.69 | 109.28 | 5.266 | 0.69 | 0.000 | 1.000 |
| 138.00 | Argus LLPX310R | 3 | 28.60 | 4.290 | 0.63 | 135.19 | 5.180 | 0.63 | 0.000 | 0.000 |
| 138.00 | DragonWave A-ANT-18G-2.5- | 1 | 47.60 | 8.430 | 1.00 | 221.04 | 10.074 | 1.00 | 0.000 | 0.000 |
| 138.00 | DragonWave Horizon | 1 | 10.60 | 0.430 | 0.50 | 40.46 | 0.658 | 0.50 | 0.000 | 0.000 |
| 138.00 | NextNet BTS-2500 | 3 | 35.00 | 1.820 | 0.50 | 92.14 | 2.392 | 0.50 | 0.000 | 0.000 |
| 138.00 | Side Arms | 1 | 560.00 | 8.500 | 1.00 | 1,024.71 | 15.554 | 1.00 | 0.000 | 0.000 |
| 132.00 | Decibel DB844H90E-XY | 9 | 14.00 | 3.610 | 0.74 | 122.81 | 3.910 | 0.74 | 0.000 | 0.000 |
| 132.00 | Flat Low Profile Platform | 1 | 1500.00 | 26.100 | 1.00 | 2,140.49 | 44.974 | 1.00 | 0.000 | 0.000 |
| 132.00 | KMW AM-X-WM-17-65-00T | 3 | 14.20 | 3.360 | 0.64 | 92.92 | 4.222 | 0.64 | 0.000 | 0.000 |
| 132.00 | KMW KMDAPS2040000 (E-F | 3 | 15.90 | 0.970 | 0.50 | 50.19 | 1.418 | 0.50 | 0.000 | 0.000 |
| 121.00 | Alcatel-Lucent 4x40W RRH | 3 | 91.00 | 3.290 | 0.67 | 213.70 | 3.121 | 0.67 | 0.000 | 0.000 |
| 121.00 | Alcatel-Lucent 800 MHz | 3 | 64.00 | 2.060 | 0.67 | 152.41 | 2.641 | 0.67 | 0.000 | 0.000 |
| 121.00 | Alcatel-Lucent TD-RRH8x20- | 3 | 70.00 | 4.050 | 0.67 | 177.77 | 4.854 | 0.67 | 0.000 | 0.000 |
| 121.00 | Flat Low Profile Platform | 1 | 1500.00 | 26.100 | 1.00 | 2,135.16 | 44.817 | 1.00 | 0.000 | 0.000 |
| 121.00 | RFS APXVSPP18-C-A20 | 3 | 57.00 | 8.020 | 0.69 | 251.54 | 9.285 | 0.69 | 0.000 | 0.000 |
| 121.00 | RFS APXVTM14-C-I20 | 3 | 52.90 | 6.340 | 0.66 | 209.10 | 7.425 | 0.66 | 0.000 | 0.000 |
| 110.00 | Diamond X50A | 2 | 2.30 | 1.120 | 1.00 | 59.70 | 2.467 | 1.00 | 0.000 | 0.000 |
| 110.00 | Flat Side Arm | 2 | 150.00 | 6.300 | 1.00 | 220.90 | 8.682 | 1.00 | 0.000 | 0.000 |
| 100.00 | Antel BCD-87010 ___ 4° | 1 | 26.50 | 2.900 | 1.00 | 154.36 | 6.564 | 1.00 | 0.000 | 5.000 |
| 100.00 | Flat Side Arm | 1 | 150.00 | 6.300 | 1.00 | 220.21 | 8.659 | 1.00 | 0.000 | 0.000 |
| 76.00 | PCTEL GPS-TMG-HR-26N | 1 | 0.60 | 0.090 | 1.00 | 0.99 | 0.149 | 1.00 | 0.000 | 0.000 |
| 76.00 | Round Side Arm | 1 | 150.00 | 5.200 | 1.00 | 218.44 | 7.742 | 1.00 | 0.000 | 0.000 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


Totals 118 11333.00 25,656.10 Number of Loadings : 45

## Linear Appurtenance Properties

| Elev From (ft) | Elev To (ft) | Qty | Description | Coax Diameter (in) | Coax Weight (lb/ft) | Flat | Projected Width (in) | Exposed To Wind | Carrier |
|---|---|---|---|---|---|---|---|---|---|
| 10.00 | 159.00 | 6 | 1 5/8" Coax | 1.98 | 0.82 | N | 0.00 | N | T-Mobile |
| 10.00 | 159.00 | 12 | 1 5/8" Coax | 1.98 | 0.82 | N | 3.96 | Y | T-Mobile |
| 10.00 | 151.00 | 2 | 0.39" (10mm) Fiber | 0.39 | 0.06 | N | 0.00 | N | AT&T Mobility |
| 10.00 | 151.00 | 2 | 0.74" 8 (18.7mm) | 0.74 | 0.49 | N | 0.00 | N | AT&T Mobility |
| 10.00 | 151.00 | 4 | 0.78" 8 (19.7mm) | 0.78 | 0.59 | N | 0.00 | N | AT&T Mobility |
| 10.00 | 151.00 | 12 | 1 1/4" Coax | 1.55 | 0.63 | N | 0.00 | N | AT&T Mobility |
| 10.00 | 151.00 | 1 | 3" Conduit | 3.50 | 7.58 | N | 0.00 | N | AT&T Mobility |
| 10.00 | 141.00 | 12 | 1 5/8" Coax | 1.98 | 0.82 | N | 0.00 | N | Verizon |
| 10.00 | 141.00 | 1 | 1 5/8" Hybriflex | 1.98 | 1.30 | N | 0.00 | Y | Verizon |
| 10.00 | 138.00 | 1 | 1/2" Coax | 0.63 | 0.15 | N | 0.00 | Y | Clearwire |
| 10.00 | 138.00 | 6 | 5/16" (0.31", 7.9mm) | 0.31 | 0.05 | N | 0.00 | N | Clearwire |
| 10.00 | 132.00 | 9 | 1 1/4" Coax | 1.55 | 0.63 | N | 0.00 | N | Sprint Nextel |
| 10.00 | 132.00 | 6 | 1 5/8" Coax | 1.98 | 0.82 | N | 0.00 | N | Sprint Nextel |
| 10.00 | 121.00 | 4 | 1 1/4" Hybriflex Cable | 1.54 | 1.00 | N | 0.00 | Y | Sprint Nextel |
| 0.00 | 113.25 | 4 | DYWIDAG | 2.50 | 16.70 | N | 1.66 | Y | - |
| 10.00 | 110.00 | 2 | 1/2" Coax | 0.63 | 0.15 | N | 0.00 | N | Senet |
| 10.00 | 100.00 | 1 | 7/8" Coax | 1.09 | 0.33 | N | 0.00 | Y | Sensus USA |
| 10.00 | 76.00 | 1 | 1/2" Coax | 0.63 | 0.15 | N | 0.00 | Y | Sprint Nextel |

## Additional Steel

| Elev From (ft) | Elev To (ft) | Qty | Description | Fy (ksi) | Offset (in) | Intermediate Connections Description | Spacing (in) | Len (in) | Connectors | Continuation? |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 105.1 | 4 | SOL #20 All Thread | 80 | 2.19 | 6" Angle Bracket | 30.0 | 3.31 | 5/8" A36 U-Bolt | No |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


## Segment Properties (Max Len : 5. ft)

| Seg Top Elev (ft) | Description | Thick (in) | Flat Dia (in) | Area ($in^2$) | Ix ($in^4$) | W/t Ratio | D/t Ratio | F'y (ksi) | S ($in^3$) | Z ($in^3$) | Weight (lb) | Additional Reinforcing Area ($in^2$) | Additional Reinforcing Ix ($in^4$) | Additional Reinforcing Weight (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.4375 | 48.000 | 66.044 | 18,876.3 | 17.93 | 109.71 | 80.3 | 774.6 | 0.0 | 0.0 | 19.64 | 7,401 | 0.0 |
| 5.00 | | 0.4375 | 47.024 | 64.690 | 17,738.5 | 17.54 | 107.48 | 80.8 | 743.0 | 0.0 | 1,112.1 | 19.64 | 7,141 | 334.0 |
| 10.00 | | 0.4375 | 46.049 | 63.335 | 16,647.3 | 17.15 | 105.25 | 81.2 | 712.0 | 0.0 | 1,089.1 | 19.64 | 6,885 | 334.0 |
| 15.00 | | 0.4375 | 45.073 | 61.980 | 15,601.9 | 16.76 | 103.03 | 81.7 | 681.8 | 0.0 | 1,066.1 | 19.64 | 6,634 | 334.0 |
| 20.00 | | 0.4375 | 44.098 | 60.626 | 14,601.2 | 16.36 | 100.80 | 82.2 | 652.2 | 0.0 | 1,043.0 | 19.64 | 6,387 | 334.0 |
| 25.00 | | 0.4375 | 43.122 | 59.271 | 13,644.2 | 15.97 | 98.57 | 82.6 | 623.2 | 0.0 | 1,020.0 | 19.64 | 6,145 | 334.0 |
| 30.00 | | 0.4375 | 42.147 | 57.917 | 12,729.9 | 15.58 | 96.34 | 82.6 | 594.9 | 0.0 | 996.9 | 19.64 | 5,908 | 334.0 |
| 35.00 | | 0.4375 | 41.171 | 56.562 | 11,857.5 | 15.18 | 94.11 | 82.6 | 567.3 | 0.0 | 973.9 | 19.64 | 5,676 | 334.0 |
| 40.00 | | 0.4375 | 40.196 | 55.208 | 11,025.8 | 14.79 | 91.88 | 82.6 | 540.3 | 0.0 | 950.8 | 19.64 | 5,448 | 334.0 |
| 41.16 | Bot - Section 2 | 0.4375 | 39.969 | 54.892 | 10,838.1 | 14.70 | 91.36 | 82.6 | 534.1 | 0.0 | 217.9 | 19.64 | 5,396 | 77.7 |
| 45.00 | | 0.4375 | 39.220 | 53.853 | 10,234.0 | 14.40 | 89.65 | 82.6 | 513.9 | 0.0 | 1,330.9 | 19.64 | 5,396 | 256.3 |
| 46.83 | Top - Section 1 | 0.3750 | 39.613 | 46.702 | 9,084.7 | 17.22 | 105.64 | 81.2 | 451.7 | 0.0 | 625.9 | 19.64 | 5,314 | 122.2 |
| 50.00 | | 0.3750 | 38.995 | 45.966 | 8,661.8 | 16.93 | 103.99 | 81.5 | 437.5 | 0.0 | 499.8 | 19.64 | 5,174 | 211.8 |
| 55.00 | | 0.3750 | 38.019 | 44.805 | 8,021.9 | 16.47 | 101.39 | 82.0 | 415.6 | 0.0 | 772.2 | 19.64 | 4,956 | 334.0 |
| 60.00 | | 0.3750 | 37.044 | 43.644 | 7,414.3 | 16.01 | 98.78 | 82.6 | 394.2 | 0.0 | 752.4 | 19.64 | 4,744 | 334.0 |
| 65.00 | | 0.3750 | 36.068 | 42.483 | 6,838.2 | 15.55 | 96.18 | 82.6 | 373.4 | 0.0 | 732.7 | 19.64 | 4,536 | 334.0 |
| 70.00 | | 0.3750 | 35.093 | 41.321 | 6,292.7 | 15.09 | 93.58 | 82.6 | 353.2 | 0.0 | 712.9 | 19.64 | 4,332 | 334.0 |
| 75.00 | | 0.3750 | 34.117 | 40.160 | 5,777.0 | 14.63 | 90.98 | 82.6 | 333.5 | 0.0 | 693.2 | 19.64 | 4,134 | 334.0 |
| 76.00 | | 0.3750 | 33.922 | 39.928 | 5,677.4 | 14.54 | 90.46 | 82.6 | 329.6 | 0.0 | 136.3 | 19.64 | 4,094 | 66.8 |
| 80.00 | | 0.3750 | 33.142 | 38.999 | 5,290.3 | 14.17 | 88.38 | 82.6 | 314.4 | 0.0 | 537.1 | 19.64 | 3,940 | 267.2 |
| 81.62 | Bot - Section 3 | 0.3750 | 32.825 | 38.622 | 5,138.4 | 14.02 | 87.53 | 82.6 | 308.3 | 0.0 | 214.4 | 19.64 | 3,878 | 108.4 |
| 85.00 | | 0.3750 | 32.166 | 37.838 | 4,831.7 | 13.71 | 85.78 | 82.6 | 295.9 | 0.0 | 813.2 | 19.64 | 3,871 | 225.6 |
| 86.37 | Top - Section 2 | 0.3125 | 32.523 | 31.948 | 4,188.0 | 16.94 | 104.08 | 81.5 | 253.6 | 0.0 | 326.0 | 19.64 | 3,819 | 91.7 |
| 90.00 | | 0.3125 | 31.816 | 31.246 | 3,918.0 | 16.54 | 101.81 | 81.9 | 242.6 | 0.0 | 389.9 | 19.64 | 3,683 | 242.3 |
| 95.00 | | 0.3125 | 30.840 | 30.279 | 3,565.2 | 15.99 | 98.69 | 82.6 | 227.7 | 0.0 | 523.4 | 19.64 | 3,500 | 334.0 |
| 100.0 | | 0.3125 | 29.865 | 29.311 | 3,234.2 | 15.44 | 95.57 | 82.6 | 213.3 | 0.0 | 506.9 | 19.64 | 3,322 | 334.0 |
| 105.0 | | 0.3125 | 28.889 | 28.344 | 2,924.4 | 14.89 | 92.45 | 82.6 | 199.4 | 0.0 | 490.5 | 19.64 | 3,148 | 334.0 |
| 105.1 | Reinf. Top | 0.3125 | 28.865 | 28.319 | 2,916.9 | 14.88 | 92.37 | 82.6 | 199.0 | 0.0 | 12.1 | 19.64 | 3,144 | 8.3 |
| 110.0 | | 0.3125 | 27.914 | 27.376 | 2,635.0 | 14.34 | 89.32 | 82.6 | 185.9 | 0.0 | 462.0 | | | |
| 115.0 | | 0.3125 | 26.938 | 26.409 | 2,365.4 | 13.79 | 86.20 | 82.6 | 172.9 | 0.0 | 457.5 | | | |
| 120.0 | | 0.3125 | 25.963 | 25.441 | 2,114.8 | 13.24 | 83.08 | 82.6 | 160.4 | 0.0 | 441.1 | | | |
| 121.0 | | 0.3125 | 25.768 | 25.248 | 2,066.9 | 13.13 | 82.46 | 82.6 | 158.0 | 0.0 | 86.2 | | | |
| 125.0 | | 0.3125 | 24.987 | 24.473 | 1,882.6 | 12.69 | 79.96 | 82.6 | 148.4 | 0.0 | 338.4 | | | |
| 125.1 | Bot - Section 4 | 0.3125 | 24.963 | 24.450 | 1,877.1 | 12.67 | 79.88 | 82.6 | 148.1 | 0.0 | 10.3 | | | |
| 128.8 | Top - Section 3 | 0.2500 | 24.732 | 19.425 | 1,471.0 | 16.03 | 98.93 | 82.5 | 117.1 | 0.0 | 558.9 | | | |
| 130.0 | | 0.2500 | 24.512 | 19.251 | 1,431.7 | 15.88 | 98.05 | 82.6 | 115.0 | 0.0 | 74.1 | | | |
| 132.0 | | 0.2500 | 24.122 | 18.941 | 1,363.7 | 15.60 | 96.49 | 82.6 | 111.4 | 0.0 | 130.0 | | | |
| 135.0 | | 0.2500 | 23.536 | 18.477 | 1,265.9 | 15.19 | 94.15 | 82.6 | 105.9 | 0.0 | 191.0 | | | |
| 138.0 | | 0.2500 | 22.951 | 18.013 | 1,172.8 | 14.78 | 91.80 | 82.6 | 100.6 | 0.0 | 186.2 | | | |
| 140.0 | | 0.2500 | 22.561 | 17.703 | 1,113.3 | 14.50 | 90.24 | 82.6 | 97.2 | 0.0 | 121.5 | | | |
| 141.0 | | 0.2500 | 22.366 | 17.548 | 1,084.4 | 14.36 | 89.46 | 82.6 | 95.5 | 0.0 | 60.0 | | | |
| 145.0 | | 0.2500 | 21.585 | 16.929 | 973.6 | 13.81 | 86.34 | 82.6 | 88.8 | 0.0 | 234.6 | | | |
| 148.0 | | 0.2500 | 21.000 | 16.465 | 895.7 | 13.40 | 84.00 | 82.6 | 84.0 | 0.0 | 170.4 | | | |
| | | | | | | | | | | | 22,061.8 | | | 7,022.3 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 1.2D + 1.6W — 93 mph with No Ice — 24 Iterations

Gust Response Factor :1.10 — Wind Importance Factor 1.00
Dead Load Factor :1.20
Wind Load Factor :1.60

## Applied Segment Forces Summary

| | | Shaft Forces | | Discrete Forces | | | | Linear Forces | | Sum of Forces | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seg Elev (ft) | Description | Wind FX (lb) | Dead Load (lb) | Wind FX (lb) | Torsion MY (lb-ft) | Moment MZ (lb-ft) | Dead Load (lb) | Wind FX (lb) | Dead Load (lb) | Wind FX (lb) | Dead Load (lb) | Torsion MY (lb-ft) | Moment MZ (lb) |
| 0.00 | | 169.3 | 0.0 | | | | | 0.0 | 0.0 | 169.3 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 335.1 | 1,334.6 | | | | | 0.0 | 801.6 | 335.1 | 2,136.2 | 0.0 | 0.0 |
| 10.00 | | 338.6 | 1,306.9 | | | | | 0.0 | 801.6 | 338.6 | 2,108.5 | 0.0 | 0.0 |
| 15.00 | | 343.2 | 1,279.3 | | | | | 0.0 | 1,163.5 | 343.2 | 2,442.8 | 0.0 | 0.0 |
| 20.00 | | 338.3 | 1,251.6 | | | | | 0.0 | 1,163.5 | 338.3 | 2,415.1 | 0.0 | 0.0 |
| 25.00 | | 333.5 | 1,223.9 | | | | | 0.0 | 1,163.5 | 333.5 | 2,387.5 | 0.0 | 0.0 |
| 30.00 | | 332.5 | 1,196.3 | | | | | 0.0 | 1,163.5 | 332.5 | 2,359.8 | 0.0 | 0.0 |
| 35.00 | | 338.4 | 1,168.6 | | | | | 0.0 | 1,163.5 | 338.4 | 2,332.1 | 0.0 | 0.0 |
| 40.00 | | 211.8 | 1,141.0 | | | | | 0.0 | 1,163.5 | 211.8 | 2,304.5 | 0.0 | 0.0 |
| 41.16 | Bot - Section 2 | 177.4 | 261.5 | | | | | 0.0 | 270.7 | 177.4 | 532.2 | 0.0 | 0.0 |
| 45.00 | | 203.1 | 1,597.1 | | | | | 0.0 | 892.8 | 203.1 | 2,489.9 | 0.0 | 0.0 |
| 46.83 | Top - Section 1 | 180.4 | 751.1 | | | | | 0.0 | 425.8 | 180.4 | 1,177.0 | 0.0 | 0.0 |
| 50.00 | | 296.7 | 599.8 | | | | | 0.0 | 737.7 | 296.7 | 1,337.4 | 0.0 | 0.0 |
| 55.00 | | 366.4 | 926.6 | | | | | 0.0 | 1,163.5 | 366.4 | 2,090.1 | 0.0 | 0.0 |
| 60.00 | | 369.7 | 902.9 | | | | | 0.0 | 1,163.5 | 369.7 | 2,066.4 | 0.0 | 0.0 |
| 65.00 | | 372.2 | 879.2 | | | | | 0.0 | 1,163.5 | 372.2 | 2,042.7 | 0.0 | 0.0 |
| 70.00 | | 374.0 | 855.5 | | | | | 0.0 | 1,163.5 | 374.0 | 2,019.0 | 0.0 | 0.0 |
| 75.00 | | 224.9 | 831.8 | | | | | 0.0 | 1,163.5 | 224.9 | 1,995.3 | 0.0 | 0.0 |
| 76.00 | Appertunance(s) | 187.8 | 163.5 | 178.9 | 0.0 | 0.0 | 180.7 | 0.0 | 232.7 | 366.7 | 576.9 | 0.0 | 0.0 |
| 80.00 | | 211.2 | 644.6 | | | | | 0.0 | 930.1 | 211.2 | 1,574.7 | 0.0 | 0.0 |
| 81.62 | Bot - Section 3 | 190.3 | 257.3 | | | | | 0.0 | 377.5 | 190.3 | 634.7 | 0.0 | 0.0 |
| 85.00 | | 181.9 | 975.8 | | | | | 0.0 | 785.1 | 181.9 | 1,760.9 | 0.0 | 0.0 |
| 86.37 | Top - Section 2 | 190.3 | 391.2 | | | | | 0.0 | 319.3 | 190.3 | 710.5 | 0.0 | 0.0 |
| 90.00 | | 327.3 | 467.9 | | | | | 0.0 | 843.3 | 327.3 | 1,311.2 | 0.0 | 0.0 |
| 95.00 | | 378.6 | 628.1 | | | | | 0.0 | 1,162.6 | 378.6 | 1,790.7 | 0.0 | 0.0 |
| 100.00 | Appertunance(s) | 377.3 | 608.3 | 338.1 | 0.0 | 537.9 | 211.8 | 0.0 | 1,162.6 | 715.4 | 1,982.7 | 0.0 | 0.0 |
| 105.00 | | 193.0 | 588.6 | | | | | 0.0 | 1,160.6 | 193.0 | 1,749.2 | 0.0 | 0.0 |
| 105.13 | Reinf. Top | 187.4 | 14.5 | | | | | 0.0 | 29.0 | 187.4 | 43.5 | 0.0 | 0.0 |
| 110.00 | Appertunance(s) | 360.0 | 554.3 | 557.9 | 0.0 | 0.0 | 365.5 | 0.0 | 740.8 | 917.9 | 1,660.7 | 0.0 | 0.0 |
| 115.00 | | 336.5 | 549.1 | | | | | 0.0 | 617.7 | 336.5 | 1,166.8 | 0.0 | 0.0 |
| 120.00 | | 190.8 | 529.3 | | | | | 0.0 | 357.2 | 190.8 | 886.5 | 0.0 | 0.0 |
| 121.00 | Appertunance(s) | 157.4 | 103.5 | 2,493.3 | 0.0 | 0.0 | 3,005.6 | 0.0 | 71.4 | 2,650.7 | 3,180.6 | 0.0 | 0.0 |
| 125.00 | | 129.7 | 406.1 | | | | | 0.0 | 266.6 | 129.7 | 672.6 | 0.0 | 0.0 |
| 125.12 | Bot - Section 4 | 123.1 | 12.3 | | | | | 0.0 | 8.2 | 123.1 | 20.5 | 0.0 | 0.0 |
| 128.87 | Top - Section 3 | 154.5 | 670.7 | | | | | 0.0 | 249.9 | 154.5 | 920.6 | 0.0 | 0.0 |
| 130.00 | | 97.7 | 89.0 | | | | | 0.0 | 75.1 | 97.7 | 164.1 | 0.0 | 0.0 |
| 132.00 | Appertunance(s) | 155.5 | 156.0 | 2,046.0 | 0.0 | 0.0 | 2,059.6 | 0.0 | 133.3 | 2,201.4 | 2,348.8 | 0.0 | 0.0 |
| 135.00 | | 185.3 | 229.2 | | | | | 0.0 | 161.8 | 185.3 | 391.0 | 0.0 | 0.0 |
| 138.00 | Appertunance(s) | 153.4 | 223.5 | 966.1 | 0.0 | 0.0 | 970.8 | 0.0 | 161.8 | 1,119.5 | 1,356.1 | 0.0 | 0.0 |
| 140.00 | | 91.5 | 145.8 | | | | | 0.0 | 106.8 | 91.5 | 252.6 | 0.0 | 0.0 |
| 141.00 | Appertunance(s) | 151.1 | 72.0 | 2,781.5 | 0.0 | 1,728.1 | 2,266.1 | 0.0 | 53.4 | 2,932.6 | 2,391.4 | 0.0 | 0.0 |
| 145.00 | | 210.3 | 281.6 | | | | | 0.0 | 160.1 | 210.3 | 441.7 | 0.0 | 0.0 |
| 148.00 | Appertunance(s) | 89.6 | 204.5 | 196.4 | 0.0 | 0.0 | 240.0 | 0.0 | 120.1 | 286.0 | 564.6 | 0.0 | 0.0 |
| | | | | | | | | | Totals: | 19,875.1 | 62,790.3 | 0.00 | 0.00 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 1.2D + 1.6W 93 mph with No Ice 24 Iterations

Gust Response Factor :1.10 Wind Importance Factor 1.00
Dead Load Factor :1.20
Wind Load Factor :1.60

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -67.06 | -24.48 | 0.00 | -2,852.09 | 0.00 | 2,852.09 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.450 |
| 5.00 | -64.86 | -24.32 | 0.00 | -2,729.68 | 0.00 | 2,729.68 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.08 | -0.15 | 0.443 |
| 10.00 | -62.69 | -24.14 | 0.00 | -2,608.09 | 0.00 | 2,608.09 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.32 | -0.30 | 0.436 |
| 15.00 | -60.18 | -23.94 | 0.00 | -2,487.40 | 0.00 | 2,487.40 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.72 | -0.46 | 0.428 |
| 20.00 | -57.70 | -23.74 | 0.00 | -2,367.69 | 0.00 | 2,367.69 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 1.29 | -0.61 | 0.420 |
| 25.00 | -55.26 | -23.53 | 0.00 | -2,249.01 | 0.00 | 2,249.01 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 2.01 | -0.77 | 0.411 |
| 30.00 | -52.84 | -23.31 | 0.00 | -2,131.37 | 0.00 | 2,131.37 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 2.90 | -0.93 | 0.405 |
| 35.00 | -50.45 | -23.07 | 0.00 | -2,014.85 | 0.00 | 2,014.85 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 3.96 | -1.09 | 0.397 |
| 40.00 | -48.11 | -22.89 | 0.00 | -1,899.52 | 0.00 | 1,899.52 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 5.18 | -1.24 | 0.389 |
| 41.16 | -47.55 | -22.77 | 0.00 | -1,872.90 | 0.00 | 1,872.90 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 5.49 | -1.28 | 0.387 |
| 45.00 | -45.03 | -22.58 | 0.00 | -1,785.55 | 0.00 | 1,785.55 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 6.57 | -1.40 | 0.376 |
| 46.83 | -43.83 | -22.43 | 0.00 | -1,744.24 | 0.00 | 1,744.24 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 7.12 | -1.46 | 0.410 |
| 50.00 | -42.45 | -22.20 | 0.00 | -1,673.14 | 0.00 | 1,673.14 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 8.13 | -1.56 | 0.401 |
| 55.00 | -40.30 | -21.89 | 0.00 | -1,562.16 | 0.00 | 1,562.16 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 9.85 | -1.73 | 0.386 |
| 60.00 | -38.19 | -21.56 | 0.00 | -1,452.73 | 0.00 | 1,452.73 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 11.75 | -1.90 | 0.371 |
| 65.00 | -36.10 | -21.22 | 0.00 | -1,344.93 | 0.00 | 1,344.93 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 13.83 | -2.06 | 0.358 |
| 70.00 | -34.04 | -20.87 | 0.00 | -1,238.83 | 0.00 | 1,238.83 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 16.07 | -2.22 | 0.343 |
| 75.00 | -32.02 | -20.61 | 0.00 | -1,134.49 | 0.00 | 1,134.49 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 18.48 | -2.38 | 0.328 |
| 76.00 | -31.43 | -20.27 | 0.00 | -1,113.88 | 0.00 | 1,113.88 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 18.99 | -2.41 | 0.324 |
| 80.00 | -29.84 | -20.03 | 0.00 | -1,032.81 | 0.00 | 1,032.81 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 21.06 | -2.54 | 0.311 |
| 81.62 | -29.18 | -19.86 | 0.00 | -1,000.29 | 0.00 | 1,000.29 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 21.93 | -2.59 | 0.306 |
| 85.00 | -27.41 | -19.63 | 0.00 | -933.24 | 0.00 | 933.24 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 23.80 | -2.69 | 0.289 |
| 86.37 | -26.68 | -19.44 | 0.00 | -906.29 | 0.00 | 906.29 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 24.58 | -2.73 | 0.313 |
| 90.00 | -25.35 | -19.10 | 0.00 | -835.80 | 0.00 | 835.80 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 26.70 | -2.84 | 0.296 |
| 95.00 | -23.53 | -18.69 | 0.00 | -740.29 | 0.00 | 740.29 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 29.75 | -2.99 | 0.272 |
| 100.00 | -21.55 | -17.92 | 0.00 | -646.28 | 0.00 | 646.28 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 32.95 | -3.12 | 0.248 |
| 105.00 | -19.79 | -17.66 | 0.00 | -556.67 | 0.00 | 556.67 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 36.30 | -3.26 | 0.223 |
| 105.13 | -19.74 | -17.49 | 0.00 | -554.46 | 0.00 | 554.46 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 36.38 | -3.26 | 0.222 |
| 105.13 | -19.74 | -17.49 | 0.00 | -554.46 | 0.00 | 554.46 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 36.38 | -3.26 | 0.460 |
| 110.00 | -18.08 | -16.53 | 0.00 | -469.21 | 0.00 | 469.21 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 39.77 | -3.38 | 0.417 |
| 115.00 | -16.88 | -16.19 | 0.00 | -386.56 | 0.00 | 386.56 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 43.43 | -3.61 | 0.370 |
| 120.00 | -15.97 | -15.97 | 0.00 | -305.61 | 0.00 | 305.61 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 47.32 | -3.81 | 0.316 |
| 121.00 | -12.95 | -13.14 | 0.00 | -289.64 | 0.00 | 289.64 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 48.12 | -3.86 | 0.303 |
| 125.00 | -12.27 | -12.98 | 0.00 | -237.09 | 0.00 | 237.09 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 51.42 | -4.00 | 0.265 |
| 125.12 | -12.25 | -12.87 | 0.00 | -235.49 | 0.00 | 235.49 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 51.52 | -4.00 | 0.264 |
| 128.87 | -11.32 | -12.66 | 0.00 | -187.23 | 0.00 | 187.23 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 54.71 | -4.12 | 0.266 |
| 130.00 | -11.16 | -12.56 | 0.00 | -172.97 | 0.00 | 172.97 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 55.69 | -4.16 | 0.251 |
| 132.00 | -8.96 | -10.21 | 0.00 | -147.84 | 0.00 | 147.84 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 57.44 | -4.22 | 0.221 |
| 135.00 | -8.57 | -10.01 | 0.00 | -117.22 | 0.00 | 117.22 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 60.12 | -4.30 | 0.185 |
| 138.00 | -7.30 | -8.79 | 0.00 | -87.20 | 0.00 | 87.20 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 62.85 | -4.37 | 0.146 |
| 140.00 | -7.05 | -8.69 | 0.00 | -69.61 | 0.00 | 69.61 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 64.69 | -4.41 | 0.121 |
| 141.00 | -4.89 | -5.58 | 0.00 | -59.20 | 0.00 | 59.20 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 65.61 | -4.43 | 0.104 |
| 145.00 | -4.46 | -5.34 | 0.00 | -36.88 | 0.00 | 36.88 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 69.34 | -4.48 | 0.071 |
| 148.00 | 0.00 | -4.97 | 0.00 | -20.86 | 0.00 | 20.86 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 72.16 | -4.50 | 0.040 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 0.9D + 1.6W — 93 mph with No Ice (Reduced DL) — 24 Iterations

Gust Response Factor :1.10
Dead Load Factor :0.90
Wind Load Factor :1.60

Wind Importance Factor :1.00

## Applied Segment Forces Summary

| Seg Elev (ft) | Description | Shaft Forces Wind FX (lb) | Shaft Forces Dead Load (lb) | Discrete Forces Wind FX (lb) | Discrete Forces Torsion MY (lb-ft) | Discrete Forces Moment MZ (lb-ft) | Discrete Forces Dead Load (lb) | Linear Forces Wind FX (lb) | Linear Forces Dead Load (lb) | Sum of Forces Wind FX (lb) | Sum of Forces Dead Load (lb) | Sum of Forces Torsion MY (lb-ft) | Sum of Forces Moment MZ (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 169.3 | 0.0 | | | | | 0.0 | 0.0 | 169.3 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 335.1 | 1,000.9 | | | | | 0.0 | 601.2 | 335.1 | 1,602.1 | 0.0 | 0.0 |
| 10.00 | | 328.2 | 980.2 | | | | | 0.0 | 601.2 | 328.2 | 1,581.4 | 0.0 | 0.0 |
| 15.00 | | 321.2 | 959.4 | | | | | 0.0 | 872.6 | 321.2 | 1,832.1 | 0.0 | 0.0 |
| 20.00 | | 314.3 | 938.7 | | | | | 0.0 | 872.6 | 314.3 | 1,811.3 | 0.0 | 0.0 |
| 25.00 | | 307.3 | 918.0 | | | | | 0.0 | 872.6 | 307.3 | 1,790.6 | 0.0 | 0.0 |
| 30.00 | | 303.9 | 897.2 | | | | | 0.0 | 872.6 | 303.9 | 1,769.9 | 0.0 | 0.0 |
| 35.00 | | 306.7 | 876.5 | | | | | 0.0 | 872.6 | 306.7 | 1,749.1 | 0.0 | 0.0 |
| 40.00 | | 190.9 | 855.7 | | | | | 0.0 | 872.6 | 190.9 | 1,728.4 | 0.0 | 0.0 |
| 41.16 | Bot - Section 2 | 158.7 | 196.1 | | | | | 0.0 | 203.0 | 158.7 | 399.2 | 0.0 | 0.0 |
| 45.00 | | 181.1 | 1,197.8 | | | | | 0.0 | 669.6 | 181.1 | 1,867.4 | 0.0 | 0.0 |
| 46.83 | Top - Section 1 | 160.5 | 563.3 | | | | | 0.0 | 319.4 | 160.5 | 882.7 | 0.0 | 0.0 |
| 50.00 | | 263.0 | 449.8 | | | | | 0.0 | 553.2 | 263.0 | 1,003.1 | 0.0 | 0.0 |
| 55.00 | | 322.3 | 695.0 | | | | | 0.0 | 872.6 | 322.3 | 1,567.6 | 0.0 | 0.0 |
| 60.00 | | 322.0 | 677.2 | | | | | 0.0 | 872.6 | 322.0 | 1,549.8 | 0.0 | 0.0 |
| 65.00 | | 320.8 | 659.4 | | | | | 0.0 | 872.6 | 320.8 | 1,532.0 | 0.0 | 0.0 |
| 70.00 | | 318.8 | 641.6 | | | | | 0.0 | 872.6 | 318.8 | 1,514.3 | 0.0 | 0.0 |
| 75.00 | | 190.4 | 623.8 | | | | | 0.0 | 872.6 | 190.4 | 1,496.5 | 0.0 | 0.0 |
| 76.00 | Appertunance(s) | 157.3 | 122.6 | 178.9 | 0.0 | 0.0 | 135.5 | 0.0 | 174.5 | 336.2 | 432.7 | 0.0 | 0.0 |
| 80.00 | | 176.4 | 483.4 | | | | | 0.0 | 697.6 | 176.4 | 1,181.0 | 0.0 | 0.0 |
| 81.62 | Bot - Section 3 | 157.5 | 192.9 | | | | | 0.0 | 283.1 | 157.5 | 476.0 | 0.0 | 0.0 |
| 85.00 | | 150.0 | 731.8 | | | | | 0.0 | 588.9 | 150.0 | 1,320.7 | 0.0 | 0.0 |
| 86.37 | Top - Section 2 | 156.4 | 293.4 | | | | | 0.0 | 239.5 | 156.4 | 532.9 | 0.0 | 0.0 |
| 90.00 | | 267.4 | 350.9 | | | | | 0.0 | 632.5 | 267.4 | 983.4 | 0.0 | 0.0 |
| 95.00 | | 305.7 | 471.1 | | | | | 0.0 | 872.0 | 305.7 | 1,343.0 | 0.0 | 0.0 |
| 100.00 | Appertunance(s) | 300.4 | 456.2 | 338.1 | 0.0 | 537.9 | 158.8 | 0.0 | 872.0 | 638.5 | 1,487.0 | 0.0 | 0.0 |
| 105.00 | | 152.5 | 441.4 | | | | | 0.0 | 870.5 | 152.5 | 1,311.9 | 0.0 | 0.0 |
| 105.13 | Reinf. Top | 145.9 | 10.8 | | | | | 0.0 | 21.8 | 145.9 | 32.6 | 0.0 | 0.0 |
| 110.00 | Appertunance(s) | 284.9 | 415.8 | 557.9 | 0.0 | 0.0 | 274.1 | 0.0 | 555.6 | 842.8 | 1,245.5 | 0.0 | 0.0 |
| 115.00 | | 282.0 | 411.8 | | | | | 0.0 | 463.3 | 282.0 | 875.1 | 0.0 | 0.0 |
| 120.00 | | 166.8 | 397.0 | | | | | 0.0 | 267.9 | 166.8 | 664.9 | 0.0 | 0.0 |
| 121.00 | Appertunance(s) | 135.8 | 77.6 | 2,493.3 | 0.0 | 0.0 | 2,254.2 | 0.0 | 53.6 | 2,629.1 | 2,385.4 | 0.0 | 0.0 |
| 125.00 | | 111.7 | 304.5 | | | | | 0.0 | 199.9 | 111.7 | 504.5 | 0.0 | 0.0 |
| 125.12 | Bot - Section 4 | 104.7 | 9.2 | | | | | 0.0 | 6.2 | 104.7 | 15.4 | 0.0 | 0.0 |
| 128.87 | Top - Section 3 | 131.4 | 503.0 | | | | | 0.0 | 187.4 | 131.4 | 690.5 | 0.0 | 0.0 |
| 130.00 | | 82.9 | 66.7 | | | | | 0.0 | 56.3 | 82.9 | 123.0 | 0.0 | 0.0 |
| 132.00 | Appertunance(s) | 131.0 | 117.0 | 2,046.0 | 0.0 | 0.0 | 1,544.7 | 0.0 | 100.0 | 2,176.9 | 1,761.6 | 0.0 | 0.0 |
| 135.00 | | 154.8 | 171.9 | | | | | 0.0 | 121.4 | 154.8 | 293.3 | 0.0 | 0.0 |
| 138.00 | Appertunance(s) | 127.0 | 167.6 | 966.1 | 0.0 | 0.0 | 728.1 | 0.0 | 121.4 | 1,093.1 | 1,017.1 | 0.0 | 0.0 |
| 140.00 | | 75.2 | 109.4 | | | | | 0.0 | 80.1 | 75.2 | 189.5 | 0.0 | 0.0 |
| 141.00 | Appertunance(s) | 122.9 | 54.0 | 2,781.5 | 0.0 | 1,728.1 | 1,699.6 | 0.0 | 40.0 | 2,904.4 | 1,793.6 | 0.0 | 0.0 |
| 145.00 | | 169.6 | 211.2 | | | | | 0.0 | 120.1 | 169.6 | 331.3 | 0.0 | 0.0 |
| 148.00 | Appertunance(s) | 71.7 | 153.4 | 196.4 | 0.0 | 0.0 | 180.0 | 0.0 | 90.1 | 268.1 | 423.5 | 0.0 | 0.0 |
| | | | | | | | | | Totals: | 18,494.5 | 47,092.7 | 0.00 | 0.00 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 0.9D + 1.6W 93 mph with No Ice (Reduced DL) 24 Iterations

Gust Response Factor :1.10 Wind Importance Factor :1.00
Dead Load Factor :0.90
Wind Load Factor :1.60

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -50.29 | -23.08 | 0.00 | -2,688.76 | 0.00 | 2,688.76 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.422 |
| 5.00 | -48.63 | -22.86 | 0.00 | -2,573.38 | 0.00 | 2,573.38 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.08 | -0.14 | 0.416 |
| 10.00 | -46.99 | -22.65 | 0.00 | -2,459.07 | 0.00 | 2,459.07 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.30 | -0.29 | 0.409 |
| 15.00 | -45.11 | -22.43 | 0.00 | -2,345.85 | 0.00 | 2,345.85 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.68 | -0.43 | 0.402 |
| 20.00 | -43.24 | -22.21 | 0.00 | -2,233.71 | 0.00 | 2,233.71 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 1.21 | -0.58 | 0.394 |
| 25.00 | -41.40 | -21.99 | 0.00 | -2,122.67 | 0.00 | 2,122.67 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 1.90 | -0.73 | 0.386 |
| 30.00 | -39.57 | -21.76 | 0.00 | -2,012.73 | 0.00 | 2,012.73 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 2.74 | -0.87 | 0.380 |
| 35.00 | -37.77 | -21.53 | 0.00 | -1,903.92 | 0.00 | 1,903.92 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 3.73 | -1.02 | 0.373 |
| 40.00 | -36.02 | -21.36 | 0.00 | -1,796.29 | 0.00 | 1,796.29 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 4.89 | -1.17 | 0.366 |
| 41.16 | -35.59 | -21.24 | 0.00 | -1,771.45 | 0.00 | 1,771.45 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 5.18 | -1.21 | 0.364 |
| 45.00 | -33.70 | -21.07 | 0.00 | -1,689.95 | 0.00 | 1,689.95 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 6.20 | -1.33 | 0.354 |
| 46.83 | -32.79 | -20.93 | 0.00 | -1,651.40 | 0.00 | 1,651.40 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 6.72 | -1.38 | 0.386 |
| 50.00 | -31.75 | -20.71 | 0.00 | -1,585.05 | 0.00 | 1,585.05 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 7.67 | -1.48 | 0.378 |
| 55.00 | -30.13 | -20.43 | 0.00 | -1,481.49 | 0.00 | 1,481.49 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 9.30 | -1.63 | 0.365 |
| 60.00 | -28.54 | -20.14 | 0.00 | -1,379.34 | 0.00 | 1,379.34 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 11.09 | -1.79 | 0.351 |
| 65.00 | -26.97 | -19.84 | 0.00 | -1,278.64 | 0.00 | 1,278.64 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 13.05 | -1.95 | 0.339 |
| 70.00 | -25.41 | -19.54 | 0.00 | -1,179.42 | 0.00 | 1,179.42 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 15.18 | -2.10 | 0.325 |
| 75.00 | -23.89 | -19.33 | 0.00 | -1,081.73 | 0.00 | 1,081.73 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 17.46 | -2.25 | 0.311 |
| 76.00 | -23.45 | -19.01 | 0.00 | -1,062.41 | 0.00 | 1,062.41 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 17.93 | -2.28 | 0.308 |
| 80.00 | -22.25 | -18.81 | 0.00 | -986.38 | 0.00 | 986.38 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 19.90 | -2.40 | 0.296 |
| 81.62 | -21.76 | -18.67 | 0.00 | -955.84 | 0.00 | 955.84 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 20.72 | -2.45 | 0.291 |
| 85.00 | -20.42 | -18.48 | 0.00 | -892.81 | 0.00 | 892.81 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 22.49 | -2.55 | 0.276 |
| 86.37 | -19.87 | -18.33 | 0.00 | -867.43 | 0.00 | 867.43 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 23.23 | -2.59 | 0.298 |
| 90.00 | -18.86 | -18.05 | 0.00 | -800.97 | 0.00 | 800.97 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 25.24 | -2.69 | 0.282 |
| 95.00 | -17.50 | -17.73 | 0.00 | -710.70 | 0.00 | 710.70 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 28.13 | -2.83 | 0.259 |
| 100.00 | -16.00 | -17.05 | 0.00 | -621.53 | 0.00 | 621.53 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 31.17 | -2.97 | 0.237 |
| 105.00 | -14.68 | -16.84 | 0.00 | -536.28 | 0.00 | 536.28 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 34.34 | -3.09 | 0.214 |
| 105.13 | -14.64 | -16.71 | 0.00 | -534.18 | 0.00 | 534.18 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 34.42 | -3.09 | 0.213 |
| 105.13 | -14.64 | -16.71 | 0.00 | -534.18 | 0.00 | 534.18 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 34.42 | -3.09 | 0.441 |
| 110.00 | -13.40 | -15.84 | 0.00 | -452.71 | 0.00 | 452.71 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 37.64 | -3.21 | 0.400 |
| 115.00 | -12.48 | -15.56 | 0.00 | -373.50 | 0.00 | 373.50 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 41.12 | -3.43 | 0.355 |
| 120.00 | -11.80 | -15.37 | 0.00 | -295.72 | 0.00 | 295.72 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 44.82 | -3.63 | 0.304 |
| 121.00 | -9.56 | -12.61 | 0.00 | -280.35 | 0.00 | 280.35 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 45.59 | -3.67 | 0.292 |
| 125.00 | -9.05 | -12.48 | 0.00 | -229.90 | 0.00 | 229.90 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 48.72 | -3.81 | 0.255 |
| 125.12 | -9.03 | -12.38 | 0.00 | -228.36 | 0.00 | 228.36 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 48.82 | -3.81 | 0.254 |
| 128.87 | -8.34 | -12.22 | 0.00 | -181.93 | 0.00 | 181.93 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 51.86 | -3.93 | 0.257 |
| 130.00 | -8.21 | -12.13 | 0.00 | -168.16 | 0.00 | 168.16 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 52.80 | -3.96 | 0.242 |
| 132.00 | -6.59 | -9.85 | 0.00 | -143.90 | 0.00 | 143.90 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 54.47 | -4.03 | 0.214 |
| 135.00 | -6.30 | -9.68 | 0.00 | -114.36 | 0.00 | 114.36 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 57.02 | -4.11 | 0.179 |
| 138.00 | -5.35 | -8.52 | 0.00 | -85.33 | 0.00 | 85.33 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 59.63 | -4.17 | 0.141 |
| 140.00 | -5.17 | -8.43 | 0.00 | -68.29 | 0.00 | 68.29 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 61.38 | -4.21 | 0.118 |
| 141.00 | -3.59 | -5.41 | 0.00 | -58.13 | 0.00 | 58.13 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 62.27 | -4.23 | 0.101 |
| 145.00 | -3.27 | -5.22 | 0.00 | -36.50 | 0.00 | 36.50 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 65.83 | -4.28 | 0.069 |
| 148.00 | 0.00 | -4.96 | 0.00 | -20.86 | 0.00 | 20.86 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 68.52 | -4.30 | 0.040 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 1.2D + 1.0Di + 1.0Wi 50 mph with 0.75 in Radial Ice 23 Iterations

Gust Response Factor :1.10 Ice Dead Load Factor :1.00 Wind Importance Factor :1.00
Dead Load Factor :1.20 Ice Importance Factor :1.00
Wind Load Factor :1.00

## Applied Segment Forces Summary

| | | Shaft Forces | | Discrete Forces | | | | Linear Forces | | Sum of Forces | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seg Elev (ft) | Description | Wind FX (lb) | Dead Load (lb) | Wind FX (lb) | Torsion MY (lb-ft) | Moment MZ (lb-ft) | Dead Load (lb) | Wind FX (lb) | Dead Load (lb) | Wind FX (lb) | Dead Load (lb) | Torsion MY (lb-ft) | Moment MZ (lb) |
| 0.00 | | 59.2 | 0.0 | | | | | 0.0 | 0.0 | 59.2 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 117.5 | 1,684.4 | | | | | 0.0 | 865.3 | 117.5 | 2,549.7 | 0.0 | 0.0 |
| 10.00 | | 115.7 | 1,690.5 | | | | | 0.0 | 872.5 | 115.7 | 2,563.0 | 0.0 | 0.0 |
| 15.00 | | 113.6 | 1,675.2 | | | | | 0.0 | 1,513.5 | 113.6 | 3,188.7 | 0.0 | 0.0 |
| 20.00 | | 111.5 | 1,652.9 | | | | | 0.0 | 1,527.0 | 111.5 | 3,179.9 | 0.0 | 0.0 |
| 25.00 | | 109.3 | 1,626.9 | | | | | 0.0 | 1,537.5 | 109.3 | 3,164.5 | 0.0 | 0.0 |
| 30.00 | | 108.4 | 1,598.7 | | | | | 0.0 | 1,546.2 | 108.4 | 3,144.9 | 0.0 | 0.0 |
| 35.00 | | 109.7 | 1,568.9 | | | | | 0.0 | 1,553.6 | 109.7 | 3,122.5 | 0.0 | 0.0 |
| 40.00 | | 68.4 | 1,537.9 | | | | | 0.0 | 1,560.1 | 68.4 | 3,098.1 | 0.0 | 0.0 |
| 41.16 | Bot - Section 2 | 56.9 | 354.1 | | | | | 0.0 | 363.8 | 56.9 | 718.0 | 0.0 | 0.0 |
| 45.00 | | 65.0 | 1,904.4 | | | | | 0.0 | 1,202.1 | 65.0 | 3,106.5 | 0.0 | 0.0 |
| 46.83 | Top - Section 1 | 57.7 | 897.4 | | | | | 0.0 | 574.5 | 57.7 | 1,471.9 | 0.0 | 0.0 |
| 50.00 | | 94.7 | 850.7 | | | | | 0.0 | 996.7 | 94.7 | 1,847.4 | 0.0 | 0.0 |
| 55.00 | | 116.3 | 1,316.2 | | | | | 0.0 | 1,576.0 | 116.3 | 2,892.2 | 0.0 | 0.0 |
| 60.00 | | 116.5 | 1,286.5 | | | | | 0.0 | 1,580.4 | 116.5 | 2,866.9 | 0.0 | 0.0 |
| 65.00 | | 116.4 | 1,256.4 | | | | | 0.0 | 1,584.5 | 116.4 | 2,840.8 | 0.0 | 0.0 |
| 70.00 | | 116.0 | 1,225.9 | | | | | 0.0 | 1,588.3 | 116.0 | 2,814.1 | 0.0 | 0.0 |
| 75.00 | | 69.4 | 1,195.0 | | | | | 0.0 | 1,591.9 | 69.4 | 2,786.9 | 0.0 | 0.0 |
| 76.00 | Appertunance(s) | 57.5 | 236.1 | 48.2 | 0.0 | 0.0 | 221.6 | 0.0 | 318.8 | 105.7 | 776.5 | 0.0 | 0.0 |
| 80.00 | | 64.5 | 929.4 | | | | | 0.0 | 1,259.3 | 64.5 | 2,188.7 | 0.0 | 0.0 |
| 81.62 | Bot - Section 3 | 57.7 | 372.2 | | | | | 0.0 | 511.6 | 57.7 | 883.8 | 0.0 | 0.0 |
| 85.00 | | 54.9 | 1,215.4 | | | | | 0.0 | 1,065.2 | 54.9 | 2,280.7 | 0.0 | 0.0 |
| 86.37 | Top - Section 2 | 57.4 | 488.2 | | | | | 0.0 | 433.6 | 57.4 | 921.8 | 0.0 | 0.0 |
| 90.00 | | 98.4 | 719.5 | | | | | 0.0 | 1,146.1 | 98.4 | 1,865.6 | 0.0 | 0.0 |
| 95.00 | | 112.8 | 966.5 | | | | | 0.0 | 1,582.3 | 112.8 | 2,548.9 | 0.0 | 0.0 |
| 100.00 | Appertunance(s) | 111.3 | 938.4 | 101.2 | 0.0 | 220.0 | 329.9 | 0.0 | 1,584.9 | 212.5 | 2,853.2 | 0.0 | 0.0 |
| 105.00 | | 56.6 | 910.1 | | | | | 0.0 | 1,560.5 | 56.6 | 2,470.6 | 0.0 | 0.0 |
| 105.13 | Reinf. Top | 54.3 | 22.5 | | | | | 0.0 | 39.0 | 54.3 | 61.6 | 0.0 | 0.0 |
| 110.00 | Appertunance(s) | 106.4 | 859.4 | 151.4 | 0.0 | 0.0 | 462.1 | 0.0 | 1,132.9 | 257.8 | 2,454.4 | 0.0 | 0.0 |
| 115.00 | | 105.8 | 853.1 | | | | | 0.0 | 989.0 | 105.8 | 1,842.0 | 0.0 | 0.0 |
| 120.00 | | 62.7 | 824.3 | | | | | 0.0 | 668.9 | 62.7 | 1,493.2 | 0.0 | 0.0 |
| 121.00 | Appertunance(s) | 51.3 | 162.2 | 621.3 | 0.0 | 0.0 | 5,449.7 | 0.0 | 134.0 | 672.6 | 5,745.9 | 0.0 | 0.0 |
| 125.00 | | 42.2 | 634.8 | | | | | 0.0 | 467.0 | 42.2 | 1,101.8 | 0.0 | 0.0 |
| 125.12 | Bot - Section 4 | 39.6 | 19.4 | | | | | 0.0 | 14.4 | 39.6 | 33.8 | 0.0 | 0.0 |
| 128.87 | Top - Section 3 | 49.8 | 883.9 | | | | | 0.0 | 438.5 | 49.8 | 1,322.4 | 0.0 | 0.0 |
| 130.00 | | 31.5 | 152.6 | | | | | 0.0 | 131.9 | 31.5 | 284.5 | 0.0 | 0.0 |
| 132.00 | Appertunance(s) | 49.9 | 267.4 | 529.4 | 0.0 | 0.0 | 3,818.4 | 0.0 | 234.2 | 579.3 | 4,320.0 | 0.0 | 0.0 |
| 135.00 | | 59.1 | 392.9 | | | | | 0.0 | 313.5 | 59.1 | 706.4 | 0.0 | 0.0 |
| 138.00 | Appertunance(s) | 48.6 | 383.8 | 250.6 | 0.0 | 0.0 | 1,955.8 | 0.0 | 313.9 | 299.2 | 2,653.5 | 0.0 | 0.0 |
| 140.00 | | 28.9 | 251.2 | | | | | 0.0 | 199.3 | 28.9 | 450.5 | 0.0 | 0.0 |
| 141.00 | Appertunance(s) | 47.3 | 124.3 | 720.9 | 0.0 | 392.1 | 4,565.5 | 0.0 | 99.7 | 768.3 | 4,789.5 | 0.0 | 0.0 |
| 145.00 | | 65.5 | 484.4 | | | | | 0.0 | 319.0 | 65.5 | 803.4 | 0.0 | 0.0 |
| 148.00 | Appertunance(s) | 27.8 | 353.2 | 40.4 | 0.0 | 0.0 | 579.3 | 0.0 | 239.5 | 68.2 | 1,172.0 | 0.0 | 0.0 |
| | | | | | | | | | Totals: | 5,727.19 | 91,380.5 | 0.00 | 0.00 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 1.2D + 1.0Di + 1.0Wi 50 mph with 0.75 in Radial Ice 23 Iterations

Gust Response Factor :1.10 Ice Dead Load Factor :1.00 Wind Importance Factor :1.00
Dead Load Factor :1.20 Ice Importance Factor :1.00
Wind Load Factor :1.00

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -100.57 | -6.83 | 0.00 | -795.36 | 0.00 | 795.36 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.139 |
| 5.00 | -98.01 | -6.78 | 0.00 | -761.21 | 0.00 | 761.21 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.02 | -0.04 | 0.137 |
| 10.00 | -95.44 | -6.74 | 0.00 | -727.29 | 0.00 | 727.29 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.09 | -0.08 | 0.134 |
| 15.00 | -92.25 | -6.69 | 0.00 | -693.61 | 0.00 | 693.61 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.20 | -0.13 | 0.132 |
| 20.00 | -89.07 | -6.63 | 0.00 | -660.18 | 0.00 | 660.18 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 0.36 | -0.17 | 0.129 |
| 25.00 | -85.90 | -6.58 | 0.00 | -627.02 | 0.00 | 627.02 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 0.56 | -0.21 | 0.127 |
| 30.00 | -82.75 | -6.52 | 0.00 | -594.12 | 0.00 | 594.12 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 0.81 | -0.26 | 0.125 |
| 35.00 | -79.62 | -6.46 | 0.00 | -561.51 | 0.00 | 561.51 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 1.10 | -0.30 | 0.122 |
| 40.00 | -76.52 | -6.41 | 0.00 | -529.22 | 0.00 | 529.22 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 1.44 | -0.35 | 0.120 |
| 41.16 | -75.80 | -6.38 | 0.00 | -521.77 | 0.00 | 521.77 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 1.53 | -0.36 | 0.119 |
| 45.00 | -72.69 | -6.32 | 0.00 | -497.30 | 0.00 | 497.30 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 1.83 | -0.39 | 0.116 |
| 46.83 | -71.22 | -6.28 | 0.00 | -485.73 | 0.00 | 485.73 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 1.98 | -0.41 | 0.126 |
| 50.00 | -69.37 | -6.22 | 0.00 | -465.81 | 0.00 | 465.81 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 2.27 | -0.44 | 0.123 |
| 55.00 | -66.47 | -6.13 | 0.00 | -434.71 | 0.00 | 434.71 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 2.75 | -0.48 | 0.119 |
| 60.00 | -63.60 | -6.04 | 0.00 | -404.04 | 0.00 | 404.04 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 3.28 | -0.53 | 0.114 |
| 65.00 | -60.75 | -5.95 | 0.00 | -373.82 | 0.00 | 373.82 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 3.86 | -0.57 | 0.110 |
| 70.00 | -57.94 | -5.85 | 0.00 | -344.09 | 0.00 | 344.09 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 4.48 | -0.62 | 0.106 |
| 75.00 | -55.15 | -5.77 | 0.00 | -314.85 | 0.00 | 314.85 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 5.15 | -0.66 | 0.101 |
| 76.00 | -54.37 | -5.68 | 0.00 | -309.08 | 0.00 | 309.08 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 5.29 | -0.67 | 0.100 |
| 80.00 | -52.18 | -5.61 | 0.00 | -286.37 | 0.00 | 286.37 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 5.87 | -0.71 | 0.096 |
| 81.62 | -51.30 | -5.56 | 0.00 | -277.26 | 0.00 | 277.26 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 6.11 | -0.72 | 0.095 |
| 85.00 | -49.01 | -5.49 | 0.00 | -258.49 | 0.00 | 258.49 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 6.63 | -0.75 | 0.090 |
| 86.37 | -48.09 | -5.44 | 0.00 | -250.94 | 0.00 | 250.94 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 6.85 | -0.76 | 0.097 |
| 90.00 | -46.22 | -5.35 | 0.00 | -231.21 | 0.00 | 231.21 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 7.44 | -0.79 | 0.092 |
| 95.00 | -43.67 | -5.23 | 0.00 | -204.49 | 0.00 | 204.49 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 8.29 | -0.83 | 0.085 |
| 100.00 | -40.82 | -5.00 | 0.00 | -178.14 | 0.00 | 178.14 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 9.18 | -0.87 | 0.078 |
| 105.00 | -38.35 | -4.92 | 0.00 | -153.14 | 0.00 | 153.14 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 10.11 | -0.90 | 0.071 |
| 105.13 | -38.29 | -4.87 | 0.00 | -152.53 | 0.00 | 152.53 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 10.13 | -0.91 | 0.070 |
| 105.13 | -38.29 | -4.87 | 0.00 | -152.53 | 0.00 | 152.53 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 10.13 | -0.91 | 0.142 |
| 110.00 | -35.83 | -4.60 | 0.00 | -128.78 | 0.00 | 128.78 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 11.08 | -0.94 | 0.130 |
| 115.00 | -33.99 | -4.50 | 0.00 | -105.76 | 0.00 | 105.76 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 12.09 | -1.00 | 0.116 |
| 120.00 | -32.49 | -4.43 | 0.00 | -83.24 | 0.00 | 83.24 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 13.17 | -1.06 | 0.101 |
| 121.00 | -26.76 | -3.67 | 0.00 | -78.81 | 0.00 | 78.81 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 13.40 | -1.07 | 0.095 |
| 125.00 | -25.66 | -3.61 | 0.00 | -64.15 | 0.00 | 64.15 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 14.31 | -1.11 | 0.084 |
| 125.12 | -25.62 | -3.58 | 0.00 | -63.71 | 0.00 | 63.71 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 14.34 | -1.11 | 0.084 |
| 128.87 | -24.30 | -3.51 | 0.00 | -50.29 | 0.00 | 50.29 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 15.22 | -1.14 | 0.086 |
| 130.00 | -24.02 | -3.48 | 0.00 | -46.33 | 0.00 | 46.33 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 15.49 | -1.15 | 0.082 |
| 132.00 | -19.71 | -2.82 | 0.00 | -39.37 | 0.00 | 39.37 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 15.98 | -1.17 | 0.071 |
| 135.00 | -19.00 | -2.75 | 0.00 | -30.92 | 0.00 | 30.92 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 16.72 | -1.19 | 0.061 |
| 138.00 | -16.36 | -2.40 | 0.00 | -22.66 | 0.00 | 22.66 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 17.48 | -1.21 | 0.049 |
| 140.00 | -15.91 | -2.37 | 0.00 | -17.85 | 0.00 | 17.85 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 17.98 | -1.22 | 0.042 |
| 141.00 | -11.13 | -1.50 | 0.00 | -15.10 | 0.00 | 15.10 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 18.24 | -1.22 | 0.034 |
| 145.00 | -10.33 | -1.42 | 0.00 | -9.11 | 0.00 | 9.11 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 19.27 | -1.23 | 0.025 |
| 148.00 | 0.00 | -1.19 | 0.00 | -4.86 | 0.00 | 4.86 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 20.05 | -1.24 | 0.009 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 1.0D + 1.0W Serviceability 60 mph 22 Iterations

Gust Response Factor :1.10 Wind Importance Factor 1.00
Dead Load Factor :1.00
Wind Load Factor :1.00

## Applied Segment Forces Summary

| Seg Elev (ft) | Description | Shaft Forces Wind FX (lb) | Shaft Forces Dead Load (lb) | Discrete Forces Wind FX (lb) | Discrete Forces Torsion MY (lb-ft) | Discrete Forces Moment MZ (lb-ft) | Discrete Forces Dead Load (lb) | Linear Forces Wind FX (lb) | Linear Forces Dead Load (lb) | Sum of Forces Wind FX (lb) | Sum of Forces Dead Load (lb) | Sum of Forces Torsion MY (lb-ft) | Sum of Forces Moment MZ (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 44.0 | 0.0 | | | | | 0.0 | 0.0 | 44.0 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 87.2 | 1,112.1 | | | | | 0.0 | 668.0 | 87.2 | 1,780.1 | 0.0 | 0.0 |
| 10.00 | | 85.4 | 1,089.1 | | | | | 0.0 | 668.0 | 85.4 | 1,757.1 | 0.0 | 0.0 |
| 15.00 | | 83.6 | 1,066.1 | | | | | 0.0 | 969.6 | 83.6 | 2,035.6 | 0.0 | 0.0 |
| 20.00 | | 81.8 | 1,043.0 | | | | | 0.0 | 969.6 | 81.8 | 2,012.6 | 0.0 | 0.0 |
| 25.00 | | 79.9 | 1,020.0 | | | | | 0.0 | 969.6 | 79.9 | 1,989.5 | 0.0 | 0.0 |
| 30.00 | | 79.1 | 996.9 | | | | | 0.0 | 969.6 | 79.1 | 1,966.5 | 0.0 | 0.0 |
| 35.00 | | 79.8 | 973.9 | | | | | 0.0 | 969.6 | 79.8 | 1,943.5 | 0.0 | 0.0 |
| 40.00 | | 49.7 | 950.8 | | | | | 0.0 | 969.6 | 49.7 | 1,920.4 | 0.0 | 0.0 |
| 41.16 | Bot - Section 2 | 41.3 | 217.9 | | | | | 0.0 | 225.6 | 41.3 | 443.5 | 0.0 | 0.0 |
| 45.00 | | 47.1 | 1,330.9 | | | | | 0.0 | 744.0 | 47.1 | 2,074.9 | 0.0 | 0.0 |
| 46.83 | Top - Section 1 | 41.8 | 625.9 | | | | | 0.0 | 354.9 | 41.8 | 980.8 | 0.0 | 0.0 |
| 50.00 | | 68.4 | 499.8 | | | | | 0.0 | 614.7 | 68.4 | 1,114.5 | 0.0 | 0.0 |
| 55.00 | | 83.9 | 772.2 | | | | | 0.0 | 969.6 | 83.9 | 1,741.8 | 0.0 | 0.0 |
| 60.00 | | 83.8 | 752.4 | | | | | 0.0 | 969.6 | 83.8 | 1,722.0 | 0.0 | 0.0 |
| 65.00 | | 83.4 | 732.7 | | | | | 0.0 | 969.6 | 83.4 | 1,702.3 | 0.0 | 0.0 |
| 70.00 | | 82.9 | 712.9 | | | | | 0.0 | 969.6 | 82.9 | 1,682.5 | 0.0 | 0.0 |
| 75.00 | | 49.5 | 693.2 | | | | | 0.0 | 969.6 | 49.5 | 1,662.8 | 0.0 | 0.0 |
| 76.00 | Appertunance(s) | 40.9 | 136.3 | 46.5 | 0.0 | 0.0 | 150.6 | 0.0 | 193.9 | 87.5 | 480.8 | 0.0 | 0.0 |
| 80.00 | | 45.9 | 537.1 | | | | | 0.0 | 775.1 | 45.9 | 1,312.2 | 0.0 | 0.0 |
| 81.62 | Bot - Section 3 | 41.0 | 214.4 | | | | | 0.0 | 314.6 | 41.0 | 528.9 | 0.0 | 0.0 |
| 85.00 | | 39.0 | 813.2 | | | | | 0.0 | 654.3 | 39.0 | 1,467.4 | 0.0 | 0.0 |
| 86.37 | Top - Section 2 | 40.7 | 326.0 | | | | | 0.0 | 266.1 | 40.7 | 592.1 | 0.0 | 0.0 |
| 90.00 | | 69.6 | 389.9 | | | | | 0.0 | 702.7 | 69.6 | 1,092.7 | 0.0 | 0.0 |
| 95.00 | | 79.5 | 523.4 | | | | | 0.0 | 968.8 | 79.5 | 1,492.2 | 0.0 | 0.0 |
| 100.00 | Appertunance(s) | 78.2 | 506.9 | 87.9 | 0.0 | 139.9 | 176.5 | 0.0 | 968.8 | 166.1 | 1,652.3 | 0.0 | 0.0 |
| 105.00 | | 39.7 | 490.5 | | | | | 0.0 | 967.2 | 39.7 | 1,457.7 | 0.0 | 0.0 |
| 105.13 | Reinf. Top | 37.9 | 12.1 | | | | | 0.0 | 24.2 | 37.9 | 36.2 | 0.0 | 0.0 |
| 110.00 | Appertunance(s) | 74.1 | 462.0 | 145.1 | 0.0 | 0.0 | 304.6 | 0.0 | 617.4 | 219.2 | 1,383.9 | 0.0 | 0.0 |
| 115.00 | | 73.4 | 457.5 | | | | | 0.0 | 514.8 | 73.4 | 972.3 | 0.0 | 0.0 |
| 120.00 | | 43.4 | 441.1 | | | | | 0.0 | 297.7 | 43.4 | 738.8 | 0.0 | 0.0 |
| 121.00 | Appertunance(s) | 35.3 | 86.2 | 648.6 | 0.0 | 0.0 | 2,504.7 | 0.0 | 59.5 | 684.0 | 2,650.5 | 0.0 | 0.0 |
| 125.00 | | 29.0 | 338.4 | | | | | 0.0 | 222.2 | 29.0 | 560.5 | 0.0 | 0.0 |
| 125.12 | Bot - Section 4 | 27.2 | 10.3 | | | | | 0.0 | 6.8 | 27.2 | 17.1 | 0.0 | 0.0 |
| 128.87 | Top - Section 3 | 34.2 | 558.9 | | | | | 0.0 | 208.3 | 34.2 | 767.2 | 0.0 | 0.0 |
| 130.00 | | 21.6 | 74.1 | | | | | 0.0 | 62.6 | 21.6 | 136.7 | 0.0 | 0.0 |
| 132.00 | Appertunance(s) | 34.1 | 130.0 | 532.2 | 0.0 | 0.0 | 1,716.3 | 0.0 | 111.1 | 566.3 | 1,957.3 | 0.0 | 0.0 |
| 135.00 | | 40.3 | 191.0 | | | | | 0.0 | 134.8 | 40.3 | 325.8 | 0.0 | 0.0 |
| 138.00 | Appertunance(s) | 33.0 | 186.2 | 251.3 | 0.0 | 0.0 | 809.0 | 0.0 | 134.8 | 284.4 | 1,130.1 | 0.0 | 0.0 |
| 140.00 | | 19.6 | 121.5 | | | | | 0.0 | 89.0 | 19.6 | 210.5 | 0.0 | 0.0 |
| 141.00 | Appertunance(s) | 32.0 | 60.0 | 723.6 | 0.0 | 449.6 | 1,888.4 | 0.0 | 44.5 | 755.6 | 1,992.9 | 0.0 | 0.0 |
| 145.00 | | 44.1 | 234.6 | | | | | 0.0 | 133.4 | 44.1 | 368.1 | 0.0 | 0.0 |
| 148.00 | Appertunance(s) | 18.6 | 170.4 | 51.1 | 0.0 | 0.0 | 200.0 | 0.0 | 100.1 | 69.7 | 470.5 | 0.0 | 0.0 |
| | | | | | | | | | Totals: | 4,811.28 | 52,325.3 | 0.00 | 0.00 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case:** 1.0D + 1.0W Serviceability 60 mph 22 Iterations

Gust Response Factor :1.10 Wind Importance Factor 1.00
Dead Load Factor :1.00
Wind Load Factor :1.00

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -55.91 | -6.00 | 0.00 | -702.98 | 0.00 | 702.98 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.117 |
| 5.00 | -54.12 | -5.95 | 0.00 | -672.96 | 0.00 | 672.96 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.02 | -0.04 | 0.115 |
| 10.00 | -52.36 | -5.90 | 0.00 | -643.21 | 0.00 | 643.21 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.08 | -0.07 | 0.114 |
| 15.00 | -50.32 | -5.85 | 0.00 | -613.71 | 0.00 | 613.71 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.18 | -0.11 | 0.111 |
| 20.00 | -48.31 | -5.79 | 0.00 | -584.49 | 0.00 | 584.49 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 0.32 | -0.15 | 0.109 |
| 25.00 | -46.31 | -5.74 | 0.00 | -555.53 | 0.00 | 555.53 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 0.50 | -0.19 | 0.107 |
| 30.00 | -44.34 | -5.68 | 0.00 | -526.85 | 0.00 | 526.85 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 0.72 | -0.23 | 0.105 |
| 35.00 | -42.40 | -5.62 | 0.00 | -498.44 | 0.00 | 498.44 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 0.98 | -0.27 | 0.103 |
| 40.00 | -40.47 | -5.58 | 0.00 | -470.33 | 0.00 | 470.33 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 1.28 | -0.31 | 0.101 |
| 41.16 | -40.03 | -5.55 | 0.00 | -463.84 | 0.00 | 463.84 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 1.35 | -0.32 | 0.101 |
| 45.00 | -37.95 | -5.51 | 0.00 | -442.55 | 0.00 | 442.55 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 1.62 | -0.35 | 0.098 |
| 46.83 | -36.97 | -5.47 | 0.00 | -432.48 | 0.00 | 432.48 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 1.76 | -0.36 | 0.107 |
| 50.00 | -35.85 | -5.42 | 0.00 | -415.14 | 0.00 | 415.14 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 2.01 | -0.39 | 0.105 |
| 55.00 | -34.11 | -5.34 | 0.00 | -388.06 | 0.00 | 388.06 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 2.43 | -0.43 | 0.101 |
| 60.00 | -32.38 | -5.27 | 0.00 | -361.34 | 0.00 | 361.34 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 2.90 | -0.47 | 0.097 |
| 65.00 | -30.68 | -5.19 | 0.00 | -334.99 | 0.00 | 334.99 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 3.42 | -0.51 | 0.094 |
| 70.00 | -28.99 | -5.12 | 0.00 | -309.02 | 0.00 | 309.02 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 3.97 | -0.55 | 0.090 |
| 75.00 | -27.33 | -5.06 | 0.00 | -283.45 | 0.00 | 283.45 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 4.57 | -0.59 | 0.086 |
| 76.00 | -26.85 | -4.98 | 0.00 | -278.39 | 0.00 | 278.39 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 4.69 | -0.60 | 0.085 |
| 80.00 | -25.53 | -4.93 | 0.00 | -258.48 | 0.00 | 258.48 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 5.21 | -0.63 | 0.082 |
| 81.62 | -25.00 | -4.89 | 0.00 | -250.48 | 0.00 | 250.48 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 5.42 | -0.64 | 0.081 |
| 85.00 | -23.53 | -4.84 | 0.00 | -233.97 | 0.00 | 233.97 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 5.89 | -0.67 | 0.076 |
| 86.37 | -22.94 | -4.80 | 0.00 | -227.32 | 0.00 | 227.32 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 6.08 | -0.68 | 0.083 |
| 90.00 | -21.85 | -4.73 | 0.00 | -209.91 | 0.00 | 209.91 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 6.61 | -0.70 | 0.078 |
| 95.00 | -20.35 | -4.64 | 0.00 | -186.27 | 0.00 | 186.27 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 7.36 | -0.74 | 0.072 |
| 100.00 | -18.70 | -4.47 | 0.00 | -162.91 | 0.00 | 162.91 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 8.16 | -0.78 | 0.066 |
| 105.00 | -17.24 | -4.41 | 0.00 | -140.57 | 0.00 | 140.57 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 8.99 | -0.81 | 0.060 |
| 105.13 | -17.20 | -4.38 | 0.00 | -140.02 | 0.00 | 140.02 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 9.01 | -0.81 | 0.060 |
| 105.13 | -17.20 | -4.38 | 0.00 | -140.02 | 0.00 | 140.02 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 9.01 | -0.81 | 0.122 |
| 110.00 | -15.82 | -4.15 | 0.00 | -118.67 | 0.00 | 118.67 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 9.86 | -0.84 | 0.111 |
| 115.00 | -14.84 | -4.08 | 0.00 | -97.91 | 0.00 | 97.91 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 10.77 | -0.90 | 0.099 |
| 120.00 | -14.10 | -4.03 | 0.00 | -77.52 | 0.00 | 77.52 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 11.74 | -0.95 | 0.086 |
| 121.00 | -11.46 | -3.31 | 0.00 | -73.49 | 0.00 | 73.49 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 11.94 | -0.96 | 0.081 |
| 125.00 | -10.90 | -3.27 | 0.00 | -60.26 | 0.00 | 60.26 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 12.76 | -1.00 | 0.072 |
| 125.12 | -10.89 | -3.25 | 0.00 | -59.86 | 0.00 | 59.86 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 12.79 | -1.00 | 0.071 |
| 128.87 | -10.12 | -3.20 | 0.00 | -47.68 | 0.00 | 47.68 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 13.58 | -1.03 | 0.073 |
| 130.00 | -9.98 | -3.18 | 0.00 | -44.07 | 0.00 | 44.07 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 13.83 | -1.04 | 0.069 |
| 132.00 | -8.03 | -2.58 | 0.00 | -37.70 | 0.00 | 37.70 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 14.27 | -1.05 | 0.060 |
| 135.00 | -7.71 | -2.54 | 0.00 | -29.96 | 0.00 | 29.96 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 14.94 | -1.08 | 0.051 |
| 138.00 | -6.58 | -2.23 | 0.00 | -22.34 | 0.00 | 22.34 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 15.62 | -1.09 | 0.041 |
| 140.00 | -6.37 | -2.21 | 0.00 | -17.87 | 0.00 | 17.87 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 16.08 | -1.10 | 0.035 |
| 141.00 | -4.39 | -1.42 | 0.00 | -15.21 | 0.00 | 15.21 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 16.31 | -1.11 | 0.029 |
| 145.00 | -4.03 | -1.37 | 0.00 | -9.53 | 0.00 | 9.53 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 17.24 | -1.12 | 0.021 |
| 148.00 | 0.00 | -1.29 | 0.00 | -5.43 | 0.00 | 5.43 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 17.95 | -1.13 | 0.010 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


## Equivalent Lateral Forces Method Analysis

(Based on ASCE7-10 Chapters 11, 12, 15)

| | | |
|---|---|---|
| Spectral Response Acceleration for Short Period ($S_s$): | 0.25 | |
| Spectral Response Acceleration at 1.0 Second Period ($S_1$): | 0.07 | |
| Long-Period Transition Period ($T_L$): | 6 | |
| Importance Factor ($I_E$): | 1.00 | |
| Site Coefficient $F_a$: | 1.60 | |
| Site Coeffiecient $F_v$: | 2.40 | |
| Response Modification Coefficient (R): | 1.50 | |
| Design Spectral Response Acceleration at Short Period ($S_{ds}$): | 0.27 | |
| Design Spectral Response Acceleration at 1.0 Second Period ($S_{d1}$): | 0.11 | |
| Seismic Response Coefficient ($C_s$): | 0.03 | |
| Upper Limit $C_s$ | 0.03 | |
| Lower Limit $C_s$ | 0.03 | |
| Period based on Rayleigh Method (sec): | 2.43 | |
| Redundancy Factor (p): | 1.30 | |
| Seismic Force Distribution Exponent (k): | 1.96 | |
| Total Unfactored Dead Load: | 55.91 | k |
| Seismic Base Shear (E): | 2.21 | k |

**Load Case (1.2 + 0.2Sds) * DL + E ELFM** **Seismic Equivalent Lateral Forces Method**

| Segment | Height Above Base (ft) | Weight (lb) | $W_z$ (lb-ft) | $C_{vx}$ | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|
| 42 | 146.50 | 271 | 4,818 | 0.013 | 29 | 339 |
| 41 | 143.00 | 368 | 6,251 | 0.017 | 38 | 461 |
| 40 | 140.50 | 104 | 1,714 | 0.005 | 10 | 131 |
| 39 | 139.00 | 211 | 3,382 | 0.009 | 20 | 264 |
| 38 | 136.50 | 321 | 4,978 | 0.014 | 30 | 402 |
| 37 | 133.50 | 326 | 4,835 | 0.013 | 29 | 408 |
| 36 | 131.00 | 241 | 3,447 | 0.009 | 21 | 302 |
| 35 | 129.44 | 137 | 1,909 | 0.005 | 11 | 171 |
| 34 | 127.00 | 767 | 10,323 | 0.028 | 62 | 961 |
| 33 | 125.06 | 17 | 223 | 0.001 | 1 | 21 |
| 32 | 123.00 | 561 | 7,083 | 0.019 | 43 | 702 |
| 31 | 120.50 | 146 | 1,769 | 0.005 | 11 | 183 |
| 30 | 117.50 | 739 | 8,534 | 0.023 | 51 | 926 |
| 29 | 112.50 | 972 | 10,313 | 0.028 | 62 | 1,218 |
| 28 | 107.56 | 1,079 | 10,482 | 0.029 | 63 | 1,353 |
| 27 | 105.06 | 36 | 336 | 0.001 | 2 | 45 |
| 26 | 102.50 | 1,458 | 12,879 | 0.035 | 77 | 1,827 |
| 25 | 97.50 | 1,476 | 11,820 | 0.032 | 71 | 1,849 |
| 24 | 92.50 | 1,492 | 10,778 | 0.029 | 65 | 1,870 |
| 23 | 88.19 | 1,093 | 7,186 | 0.020 | 43 | 1,369 |
| 22 | 85.69 | 592 | 3,681 | 0.010 | 22 | 742 |
| 21 | 83.31 | 1,467 | 8,632 | 0.023 | 52 | 1,839 |
| 20 | 80.81 | 529 | 2,931 | 0.008 | 18 | 663 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | 78.00 | 1,312 | 6,783 | 0.018 | 41 | 1,644 |
| 18 | 75.50 | 330 | 1,601 | 0.004 | 10 | 414 |
| 17 | 72.50 | 1,663 | 7,446 | 0.020 | 45 | 2,084 |
| 16 | 67.50 | 1,683 | 6,548 | 0.018 | 39 | 2,108 |
| 15 | 62.50 | 1,702 | 5,696 | 0.016 | 34 | 2,133 |
| 14 | 57.50 | 1,722 | 4,893 | 0.013 | 29 | 2,158 |
| 13 | 52.50 | 1,742 | 4,140 | 0.011 | 25 | 2,183 |
| 12 | 48.42 | 1,115 | 2,259 | 0.006 | 14 | 1,397 |
| 11 | 45.92 | 981 | 1,792 | 0.005 | 11 | 1,229 |
| 10 | 43.08 | 2,075 | 3,345 | 0.009 | 20 | 2,600 |
| 9 | 40.58 | 444 | 636 | 0.002 | 4 | 556 |
| 8 | 37.50 | 1,920 | 2,358 | 0.006 | 14 | 2,407 |
| 7 | 32.50 | 1,943 | 1,802 | 0.005 | 11 | 2,435 |
| 6 | 27.50 | 1,967 | 1,314 | 0.004 | 8 | 2,464 |
| 5 | 22.50 | 1,990 | 896 | 0.002 | 5 | 2,493 |
| 4 | 17.50 | 2,013 | 554 | 0.002 | 3 | 2,522 |
| 3 | 12.50 | 2,036 | 289 | 0.001 | 2 | 2,551 |
| 2 | 7.50 | 1,757 | 92 | 0.000 | 1 | 2,202 |
| 1 | 2.50 | 1,780 | 11 | 0.000 | 0 | 2,231 |
| Commscope ATSBT-TOP- | 159.00 | 5 | 113 | 0.000 | 1 | 7 |
| Andrew E15S09P94 | 159.00 | 44 | 916 | 0.002 | 5 | 55 |
| RFS ATMAP1412D-1A20 | 159.00 | 39 | 816 | 0.002 | 5 | 49 |
| Andrew SBNHH-1D65B | 159.00 | 152 | 3,181 | 0.009 | 19 | 191 |
| Powerwave Allgon LGP | 151.00 | 169 | 3,198 | 0.009 | 19 | 212 |
| Raycap DC6-48-60-18- | 151.00 | 40 | 756 | 0.002 | 5 | 50 |
| Ericsson RRUS 11 (Ba | 151.00 | 165 | 3,118 | 0.008 | 19 | 207 |
| Ericsson RRUS 32 | 151.00 | 152 | 2,880 | 0.008 | 17 | 191 |
| Ericsson RRUS 32 B2 | 151.00 | 159 | 3,005 | 0.008 | 18 | 199 |
| Powerwave Allgon 777 | 151.00 | 105 | 1,984 | 0.005 | 12 | 132 |
| Quintel QS66512-2 | 151.00 | 333 | 6,293 | 0.017 | 38 | 417 |
| CCI OPA-65R-LCUU-H6 | 151.00 | 219 | 4,139 | 0.011 | 25 | 274 |
| Flat Platform w/ Han | 151.00 | 2,000 | 37,797 | 0.103 | 227 | 2,506 |
| Pipe Mount | 148.00 | 200 | 3,634 | 0.010 | 22 | 251 |
| RFS FD9R6004 | 141.00 | 19 | 307 | 0.001 | 2 | 23 |
| Alcatel-Lucent RRH2x | 141.00 | 132 | 2,181 | 0.006 | 13 | 165 |
| Antel BXA-171063/8CF | 141.00 | 32 | 520 | 0.001 | 3 | 39 |
| Rymsa MGD3-800T0 | 141.00 | 59 | 981 | 0.003 | 6 | 74 |
| RFS DB-T1-6Z-8AB-0Z | 141.00 | 44 | 727 | 0.002 | 4 | 55 |
| Antel BXA-80063-6BF- | 141.00 | 19 | 317 | 0.001 | 2 | 24 |
| Antel BXA-70063/6CF | 141.00 | 17 | 281 | 0.001 | 2 | 21 |
| Antel BXA-70063/6CF | 141.00 | 45 | 738 | 0.002 | 4 | 56 |
| Antel BXA-80080/6CF | 141.00 | 22 | 363 | 0.001 | 2 | 28 |
| Flat Low Profile Pla | 141.00 | 1,500 | 24,781 | 0.067 | 149 | 1,880 |
| DragonWave Horizon C | 138.00 | 11 | 168 | 0.000 | 1 | 13 |
| NextNet BTS-2500 | 138.00 | 105 | 1,663 | 0.005 | 10 | 132 |
| Argus LLPX310R | 138.00 | 86 | 1,359 | 0.004 | 8 | 108 |
| DragonWave A-ANT-18G | 138.00 | 48 | 754 | 0.002 | 5 | 60 |
| Side Arms | 138.00 | 560 | 8,869 | 0.024 | 53 | 702 |
| KMW KMDAPS2040000 (E | 132.00 | 48 | 692 | 0.002 | 4 | 60 |
| KMW AM-X-WM-17-65-00 | 132.00 | 43 | 618 | 0.002 | 4 | 53 |
| Decibel DB844H90E-XY | 132.00 | 126 | 1,829 | 0.005 | 11 | 158 |
| Flat Low Profile Pla | 132.00 | 1,500 | 21,772 | 0.059 | 131 | 1,880 |
| Alcatel-Lucent 800 M | 121.00 | 192 | 2,349 | 0.006 | 14 | 241 |
| Alcatel-Lucent 4x40W | 121.00 | 273 | 3,340 | 0.009 | 20 | 342 |
| Alcatel-Lucent TD-RR | 121.00 | 210 | 2,570 | 0.007 | 15 | 263 |
| RFS APXVTM14-C-I20 | 121.00 | 159 | 1,942 | 0.005 | 12 | 199 |
| RFS APXVSPP18-C-A20 | 121.00 | 171 | 2,092 | 0.006 | 13 | 214 |
| Flat Low Profile Pla | 121.00 | 1,500 | 18,354 | 0.050 | 110 | 1,880 |
| Diamond X50A | 110.00 | 5 | 47 | 0.000 | 0 | 6 |
| Flat Side Arm | 110.00 | 300 | 3,045 | 0.008 | 18 | 376 |
| Antel BCD-87010 ___ | 100.00 | 26 | 223 | 0.001 | 1 | 33 |
| Flat Side Arm | 100.00 | 150 | 1,263 | 0.003 | 8 | 188 |
| PCTEL GPS-TMG-HR-26N | 76.00 | 1 | 3 | 0.000 | 0 | 1 |
| Round Side Arm | 76.00 | 150 | 737 | 0.002 | 4 | 188 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


| | | | | | | |
|---|---|---|---|---|---|---|
| | | 55,908 | 367,474 | 1.000 | 2,206 | 70,060 |

**Load Case (0.9 - 0.2Sds) * DL + E ELFM** **Seismic (Reduced DL) Equivalent Lateral Forces Method**

| Segment | Height Above Base (ft) | Weight (lb) | $W_z$ (lb-ft) | $C_{vx}$ | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|
| 42 | 146.50 | 271 | 4,818 | 0.013 | 29 | 229 |
| 41 | 143.00 | 368 | 6,251 | 0.017 | 38 | 312 |
| 40 | 140.50 | 104 | 1,714 | 0.005 | 10 | 88 |
| 39 | 139.00 | 211 | 3,382 | 0.009 | 20 | 178 |
| 38 | 136.50 | 321 | 4,978 | 0.014 | 30 | 272 |
| 37 | 133.50 | 326 | 4,835 | 0.013 | 29 | 276 |
| 36 | 131.00 | 241 | 3,447 | 0.009 | 21 | 204 |
| 35 | 129.44 | 137 | 1,909 | 0.005 | 11 | 116 |
| 34 | 127.00 | 767 | 10,323 | 0.028 | 62 | 650 |
| 33 | 125.06 | 17 | 223 | 0.001 | 1 | 14 |
| 32 | 123.00 | 561 | 7,083 | 0.019 | 43 | 475 |
| 31 | 120.50 | 146 | 1,769 | 0.005 | 11 | 123 |
| 30 | 117.50 | 739 | 8,534 | 0.023 | 51 | 626 |
| 29 | 112.50 | 972 | 10,313 | 0.028 | 62 | 823 |
| 28 | 107.56 | 1,079 | 10,482 | 0.029 | 63 | 914 |
| 27 | 105.06 | 36 | 336 | 0.001 | 2 | 31 |
| 26 | 102.50 | 1,458 | 12,879 | 0.035 | 77 | 1,234 |
| 25 | 97.50 | 1,476 | 11,820 | 0.032 | 71 | 1,250 |
| 24 | 92.50 | 1,492 | 10,778 | 0.029 | 65 | 1,264 |
| 23 | 88.19 | 1,093 | 7,186 | 0.020 | 43 | 925 |
| 22 | 85.69 | 592 | 3,681 | 0.010 | 22 | 501 |
| 21 | 83.31 | 1,467 | 8,632 | 0.023 | 52 | 1,243 |
| 20 | 80.81 | 529 | 2,931 | 0.008 | 18 | 448 |
| 19 | 78.00 | 1,312 | 6,783 | 0.018 | 41 | 1,111 |
| 18 | 75.50 | 330 | 1,601 | 0.004 | 10 | 280 |
| 17 | 72.50 | 1,663 | 7,446 | 0.020 | 45 | 1,408 |
| 16 | 67.50 | 1,683 | 6,548 | 0.018 | 39 | 1,425 |
| 15 | 62.50 | 1,702 | 5,696 | 0.016 | 34 | 1,442 |
| 14 | 57.50 | 1,722 | 4,893 | 0.013 | 29 | 1,458 |
| 13 | 52.50 | 1,742 | 4,140 | 0.011 | 25 | 1,475 |
| 12 | 48.42 | 1,115 | 2,259 | 0.006 | 14 | 944 |
| 11 | 45.92 | 981 | 1,792 | 0.005 | 11 | 831 |
| 10 | 43.08 | 2,075 | 3,345 | 0.009 | 20 | 1,757 |
| 9 | 40.58 | 444 | 636 | 0.002 | 4 | 376 |
| 8 | 37.50 | 1,920 | 2,358 | 0.006 | 14 | 1,626 |
| 7 | 32.50 | 1,943 | 1,802 | 0.005 | 11 | 1,646 |
| 6 | 27.50 | 1,967 | 1,314 | 0.004 | 8 | 1,665 |
| 5 | 22.50 | 1,990 | 896 | 0.002 | 5 | 1,685 |
| 4 | 17.50 | 2,013 | 554 | 0.002 | 3 | 1,704 |
| 3 | 12.50 | 2,036 | 289 | 0.001 | 2 | 1,724 |
| 2 | 7.50 | 1,757 | 92 | 0.000 | 1 | 1,488 |
| 1 | 2.50 | 1,780 | 11 | 0.000 | 0 | 1,508 |
| Commscope ATSBT-TOP- | 159.00 | 5 | 113 | 0.000 | 1 | 5 |
| Andrew E15S09P94 | 159.00 | 44 | 916 | 0.002 | 5 | 37 |
| RFS ATMAP1412D-1A20 | 159.00 | 39 | 816 | 0.002 | 5 | 33 |
| Andrew SBNHH-1D65B | 159.00 | 152 | 3,181 | 0.009 | 19 | 129 |
| Powerwave Allgon LGP | 151.00 | 169 | 3,198 | 0.009 | 19 | 143 |
| Raycap DC6-48-60-18- | 151.00 | 40 | 756 | 0.002 | 5 | 34 |
| Ericsson RRUS 11 (Ba | 151.00 | 165 | 3,118 | 0.008 | 19 | 140 |
| Ericsson RRUS 32 | 151.00 | 152 | 2,880 | 0.008 | 17 | 129 |
| Ericsson RRUS 32 B2 | 151.00 | 159 | 3,005 | 0.008 | 18 | 135 |
| Powerwave Allgon 777 | 151.00 | 105 | 1,984 | 0.005 | 12 | 89 |
| Quintel QS66512-2 | 151.00 | 333 | 6,293 | 0.017 | 38 | 282 |
| CCI OPA-65R-LCUU-H6 | 151.00 | 219 | 4,139 | 0.011 | 25 | 185 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


| | | | | | | |
|---|---|---|---|---|---|---|
| Flat Platform w/ Han | 151.00 | 2,000 | 37,797 | 0.103 | 227 | 1,694 |
| Pipe Mount | 148.00 | 200 | 3,634 | 0.010 | 22 | 169 |
| RFS FD9R6004 | 141.00 | 19 | 307 | 0.001 | 2 | 16 |
| Alcatel-Lucent RRH2x | 141.00 | 132 | 2,181 | 0.006 | 13 | 112 |
| Antel BXA-171063/8CF | 141.00 | 32 | 520 | 0.001 | 3 | 27 |
| Rymsa MGD3-800T0 | 141.00 | 59 | 981 | 0.003 | 6 | 50 |
| RFS DB-T1-6Z-8AB-0Z | 141.00 | 44 | 727 | 0.002 | 4 | 37 |
| Antel BXA-80063-6BF- | 141.00 | 19 | 317 | 0.001 | 2 | 16 |
| Antel BXA-70063/6CF | 141.00 | 17 | 281 | 0.001 | 2 | 14 |
| Antel BXA-70063/6CF | 141.00 | 45 | 738 | 0.002 | 4 | 38 |
| Antel BXA-80080/6CF | 141.00 | 22 | 363 | 0.001 | 2 | 19 |
| Flat Low Profile Pla | 141.00 | 1,500 | 24,781 | 0.067 | 149 | 1,270 |
| DragonWave Horizon C | 138.00 | 11 | 168 | 0.000 | 1 | 9 |
| NextNet BTS-2500 | 138.00 | 105 | 1,663 | 0.005 | 10 | 89 |
| Argus LLPX310R | 138.00 | 86 | 1,359 | 0.004 | 8 | 73 |
| DragonWave A-ANT-18G | 138.00 | 48 | 754 | 0.002 | 5 | 40 |
| Side Arms | 138.00 | 560 | 8,869 | 0.024 | 53 | 474 |
| KMW KMDAPS2040000 (E | 132.00 | 48 | 692 | 0.002 | 4 | 40 |
| KMW AM-X-WM-17-65-00 | 132.00 | 43 | 618 | 0.002 | 4 | 36 |
| Decibel DB844H90E-XY | 132.00 | 126 | 1,829 | 0.005 | 11 | 107 |
| Flat Low Profile Pla | 132.00 | 1,500 | 21,772 | 0.059 | 131 | 1,270 |
| Alcatel-Lucent 800 M | 121.00 | 192 | 2,349 | 0.006 | 14 | 163 |
| Alcatel-Lucent 4x40W | 121.00 | 273 | 3,340 | 0.009 | 20 | 231 |
| Alcatel-Lucent TD-RR | 121.00 | 210 | 2,570 | 0.007 | 15 | 178 |
| RFS APXVTM14-C-I20 | 121.00 | 159 | 1,942 | 0.005 | 12 | 134 |
| RFS APXVSPP18-C-A20 | 121.00 | 171 | 2,092 | 0.006 | 13 | 145 |
| Flat Low Profile Pla | 121.00 | 1,500 | 18,354 | 0.050 | 110 | 1,270 |
| Diamond X50A | 110.00 | 5 | 47 | 0.000 | 0 | 4 |
| Flat Side Arm | 110.00 | 300 | 3,045 | 0.008 | 18 | 254 |
| Antel BCD-87010 ___ | 100.00 | 26 | 223 | 0.001 | 1 | 22 |
| Flat Side Arm | 100.00 | 150 | 1,263 | 0.003 | 8 | 127 |
| PCTEL GPS-TMG-HR-26N | 76.00 | 1 | 3 | 0.000 | 0 | 1 |
| Round Side Arm | 76.00 | 150 | 737 | 0.002 | 4 | 127 |
| | | 55,908 | 367,474 | 1.000 | 2,206 | 47,348 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


## Load Case (1.2 + 0.2Sds) * DL + E ELFM Seismic Equivalent Lateral Forces Method

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -63.34 | -1.80 | 0.00 | -202.14 | 0.00 | 202.14 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.041 |
| 5.00 | -61.14 | -1.81 | 0.00 | -193.13 | 0.00 | 193.13 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.01 | -0.01 | 0.041 |
| 10.00 | -58.59 | -1.82 | 0.00 | -184.07 | 0.00 | 184.07 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.02 | -0.02 | 0.040 |
| 15.00 | -56.06 | -1.83 | 0.00 | -174.97 | 0.00 | 174.97 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.05 | -0.03 | 0.039 |
| 20.00 | -53.57 | -1.83 | 0.00 | -165.84 | 0.00 | 165.84 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 0.09 | -0.04 | 0.038 |
| 25.00 | -51.11 | -1.83 | 0.00 | -156.69 | 0.00 | 156.69 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 0.14 | -0.05 | 0.037 |
| 30.00 | -48.67 | -1.83 | 0.00 | -147.54 | 0.00 | 147.54 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 0.20 | -0.07 | 0.036 |
| 35.00 | -46.26 | -1.82 | 0.00 | -138.42 | 0.00 | 138.42 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 0.28 | -0.08 | 0.035 |
| 40.00 | -45.71 | -1.82 | 0.00 | -129.33 | 0.00 | 129.33 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 0.36 | -0.09 | 0.034 |
| 41.16 | -43.11 | -1.80 | 0.00 | -127.22 | 0.00 | 127.22 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 0.39 | -0.09 | 0.033 |
| 45.00 | -41.88 | -1.79 | 0.00 | -120.32 | 0.00 | 120.32 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 0.46 | -0.10 | 0.032 |
| 46.83 | -40.48 | -1.78 | 0.00 | -117.04 | 0.00 | 117.04 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 0.50 | -0.10 | 0.035 |
| 50.00 | -38.30 | -1.75 | 0.00 | -111.41 | 0.00 | 111.41 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 0.57 | -0.11 | 0.034 |
| 55.00 | -36.14 | -1.73 | 0.00 | -102.64 | 0.00 | 102.64 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 0.69 | -0.12 | 0.032 |
| 60.00 | -34.01 | -1.70 | 0.00 | -94.00 | 0.00 | 94.00 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 0.82 | -0.13 | 0.031 |
| 65.00 | -31.90 | -1.66 | 0.00 | -85.52 | 0.00 | 85.52 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 0.96 | -0.14 | 0.029 |
| 70.00 | -29.81 | -1.61 | 0.00 | -77.24 | 0.00 | 77.24 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 1.11 | -0.15 | 0.028 |
| 75.00 | -29.40 | -1.60 | 0.00 | -69.18 | 0.00 | 69.18 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 1.28 | -0.16 | 0.026 |
| 76.00 | -27.57 | -1.56 | 0.00 | -67.58 | 0.00 | 67.58 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 1.31 | -0.16 | 0.025 |
| 80.00 | -26.90 | -1.54 | 0.00 | -61.35 | 0.00 | 61.35 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 1.45 | -0.17 | 0.024 |
| 81.62 | -25.06 | -1.48 | 0.00 | -58.85 | 0.00 | 58.85 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 1.51 | -0.17 | 0.023 |
| 85.00 | -24.32 | -1.46 | 0.00 | -53.84 | 0.00 | 53.84 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 1.64 | -0.18 | 0.022 |
| 86.37 | -22.95 | -1.42 | 0.00 | -51.84 | 0.00 | 51.84 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 1.69 | -0.18 | 0.024 |
| 90.00 | -21.08 | -1.35 | 0.00 | -46.70 | 0.00 | 46.70 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 1.83 | -0.19 | 0.022 |
| 95.00 | -19.23 | -1.27 | 0.00 | -39.97 | 0.00 | 39.97 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 2.03 | -0.20 | 0.019 |
| 100.00 | -17.19 | -1.18 | 0.00 | -33.60 | 0.00 | 33.60 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 2.24 | -0.20 | 0.017 |
| 105.00 | -17.14 | -1.18 | 0.00 | -27.70 | 0.00 | 27.70 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 2.45 | -0.21 | 0.016 |
| 105.13 | -15.79 | -1.11 | 0.00 | -27.55 | 0.00 | 27.55 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 2.46 | -0.21 | 0.015 |
| 105.13 | -15.79 | -1.11 | 0.00 | -27.55 | 0.00 | 27.55 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 2.46 | -0.21 | 0.030 |
| 110.00 | -14.19 | -1.03 | 0.00 | -22.12 | 0.00 | 22.12 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 2.68 | -0.22 | 0.026 |
| 115.00 | -13.26 | -0.98 | 0.00 | -16.97 | 0.00 | 16.97 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 2.91 | -0.23 | 0.023 |
| 120.00 | -13.08 | -0.97 | 0.00 | -12.09 | 0.00 | 12.09 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 3.15 | -0.23 | 0.019 |
| 121.00 | -9.24 | -0.72 | 0.00 | -11.12 | 0.00 | 11.12 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 3.20 | -0.24 | 0.016 |
| 125.00 | -9.22 | -0.72 | 0.00 | -8.23 | 0.00 | 8.23 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 3.40 | -0.24 | 0.014 |
| 125.12 | -8.26 | -0.66 | 0.00 | -8.14 | 0.00 | 8.14 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 3.41 | -0.24 | 0.013 |
| 128.87 | -8.09 | -0.65 | 0.00 | -5.67 | 0.00 | 5.67 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 3.60 | -0.25 | 0.013 |
| 130.00 | -7.78 | -0.62 | 0.00 | -4.94 | 0.00 | 4.94 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 3.66 | -0.25 | 0.012 |
| 132.00 | -5.23 | -0.44 | 0.00 | -3.69 | 0.00 | 3.69 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 3.76 | -0.25 | 0.009 |
| 135.00 | -4.82 | -0.40 | 0.00 | -2.39 | 0.00 | 2.39 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 3.92 | -0.25 | 0.007 |
| 138.00 | -3.55 | -0.30 | 0.00 | -1.17 | 0.00 | 1.17 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 4.07 | -0.25 | 0.005 |
| 140.00 | -3.42 | -0.29 | 0.00 | -0.57 | 0.00 | 0.57 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 4.18 | -0.25 | 0.004 |
| 141.00 | -0.59 | -0.05 | 0.00 | -0.28 | 0.00 | 0.28 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 4.23 | -0.25 | 0.001 |
| 145.00 | -0.25 | -0.02 | 0.00 | -0.07 | 0.00 | 0.07 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 4.44 | -0.25 | 0.000 |
| 148.00 | 0.00 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 4.60 | -0.25 | 0.000 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


**Load Case (0.9 - 0.2Sds) * DL + E ELFM** **Seismic (Reduced DL) Equivalent Lateral Forces Method**

**Calculated Forces**

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -42.81 | -1.80 | 0.00 | -199.50 | 0.00 | 199.50 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.038 |
| 5.00 | -41.32 | -1.81 | 0.00 | -190.50 | 0.00 | 190.50 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.01 | -0.01 | 0.037 |
| 10.00 | -39.59 | -1.81 | 0.00 | -181.47 | 0.00 | 181.47 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.02 | -0.02 | 0.036 |
| 15.00 | -37.89 | -1.81 | 0.00 | -172.41 | 0.00 | 172.41 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.05 | -0.03 | 0.035 |
| 20.00 | -36.20 | -1.81 | 0.00 | -163.34 | 0.00 | 163.34 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 0.09 | -0.04 | 0.034 |
| 25.00 | -34.54 | -1.81 | 0.00 | -154.27 | 0.00 | 154.27 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 0.14 | -0.05 | 0.033 |
| 30.00 | -32.89 | -1.81 | 0.00 | -145.21 | 0.00 | 145.21 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 0.20 | -0.06 | 0.033 |
| 35.00 | -31.26 | -1.80 | 0.00 | -136.18 | 0.00 | 136.18 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 0.27 | -0.07 | 0.032 |
| 40.00 | -30.89 | -1.79 | 0.00 | -127.21 | 0.00 | 127.21 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 0.36 | -0.09 | 0.031 |
| 41.16 | -29.13 | -1.77 | 0.00 | -125.12 | 0.00 | 125.12 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 0.38 | -0.09 | 0.031 |
| 45.00 | -28.30 | -1.77 | 0.00 | -118.31 | 0.00 | 118.31 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 0.45 | -0.10 | 0.030 |
| 46.83 | -27.36 | -1.75 | 0.00 | -115.08 | 0.00 | 115.08 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 0.49 | -0.10 | 0.032 |
| 50.00 | -25.88 | -1.73 | 0.00 | -109.53 | 0.00 | 109.53 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 0.56 | -0.11 | 0.031 |
| 55.00 | -24.42 | -1.70 | 0.00 | -100.88 | 0.00 | 100.88 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 0.68 | -0.12 | 0.030 |
| 60.00 | -22.98 | -1.67 | 0.00 | -92.38 | 0.00 | 92.38 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 0.81 | -0.13 | 0.028 |
| 65.00 | -21.56 | -1.63 | 0.00 | -84.03 | 0.00 | 84.03 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 0.95 | -0.14 | 0.027 |
| 70.00 | -20.15 | -1.58 | 0.00 | -75.89 | 0.00 | 75.89 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 1.10 | -0.15 | 0.025 |
| 75.00 | -19.87 | -1.58 | 0.00 | -67.96 | 0.00 | 67.96 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 1.26 | -0.16 | 0.024 |
| 76.00 | -18.63 | -1.53 | 0.00 | -66.39 | 0.00 | 66.39 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 1.29 | -0.16 | 0.023 |
| 80.00 | -18.18 | -1.51 | 0.00 | -60.27 | 0.00 | 60.27 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 1.43 | -0.17 | 0.022 |
| 81.62 | -16.94 | -1.46 | 0.00 | -57.82 | 0.00 | 57.82 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 1.49 | -0.17 | 0.021 |
| 85.00 | -16.44 | -1.44 | 0.00 | -52.89 | 0.00 | 52.89 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 1.61 | -0.18 | 0.020 |
| 86.37 | -15.51 | -1.39 | 0.00 | -50.92 | 0.00 | 50.92 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 1.66 | -0.18 | 0.021 |
| 90.00 | -14.25 | -1.32 | 0.00 | -45.88 | 0.00 | 45.88 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 1.80 | -0.18 | 0.020 |
| 95.00 | -13.00 | -1.25 | 0.00 | -39.26 | 0.00 | 39.26 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 2.00 | -0.19 | 0.018 |
| 100.00 | -11.61 | -1.16 | 0.00 | -33.01 | 0.00 | 33.01 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 2.20 | -0.20 | 0.016 |
| 105.00 | -11.58 | -1.16 | 0.00 | -27.20 | 0.00 | 27.20 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 2.42 | -0.21 | 0.014 |
| 105.13 | -10.67 | -1.09 | 0.00 | -27.06 | 0.00 | 27.06 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 2.42 | -0.21 | 0.014 |
| 105.13 | -10.67 | -1.09 | 0.00 | -27.06 | 0.00 | 27.06 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 2.42 | -0.21 | 0.027 |
| 110.00 | -9.59 | -1.01 | 0.00 | -21.72 | 0.00 | 21.72 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 2.63 | -0.21 | 0.024 |
| 115.00 | -8.96 | -0.96 | 0.00 | -16.67 | 0.00 | 16.67 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 2.86 | -0.22 | 0.020 |
| 120.00 | -8.84 | -0.95 | 0.00 | -11.88 | 0.00 | 11.88 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 3.10 | -0.23 | 0.017 |
| 121.00 | -6.24 | -0.71 | 0.00 | -10.93 | 0.00 | 10.93 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 3.15 | -0.23 | 0.015 |
| 125.00 | -6.23 | -0.71 | 0.00 | -8.08 | 0.00 | 8.08 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 3.35 | -0.24 | 0.012 |
| 125.12 | -5.58 | -0.65 | 0.00 | -7.99 | 0.00 | 7.99 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 3.35 | -0.24 | 0.012 |
| 128.87 | -5.46 | -0.63 | 0.00 | -5.57 | 0.00 | 5.57 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 3.54 | -0.24 | 0.011 |
| 130.00 | -5.26 | -0.61 | 0.00 | -4.85 | 0.00 | 4.85 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 3.60 | -0.24 | 0.010 |
| 132.00 | -3.53 | -0.43 | 0.00 | -3.63 | 0.00 | 3.63 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 3.70 | -0.24 | 0.008 |
| 135.00 | -3.26 | -0.40 | 0.00 | -2.34 | 0.00 | 2.34 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 3.85 | -0.25 | 0.006 |
| 138.00 | -2.40 | -0.30 | 0.00 | -1.15 | 0.00 | 1.15 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 4.01 | -0.25 | 0.004 |
| 140.00 | -2.31 | -0.29 | 0.00 | -0.56 | 0.00 | 0.56 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 4.11 | -0.25 | 0.003 |
| 141.00 | -0.40 | -0.05 | 0.00 | -0.28 | 0.00 | 0.28 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 4.17 | -0.25 | 0.001 |
| 145.00 | -0.17 | -0.02 | 0.00 | -0.07 | 0.00 | 0.07 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 4.37 | -0.25 | 0.000 |
| 148.00 | 0.00 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 4.53 | -0.25 | 0.000 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


## Equivalent Modal Forces Analysis

(Based on ASCE7-10 Chapters 11, 12 & 15 and ANSI/TIA-G, section 2.7)

| | |
|---|---|
| Spectral Response Acceleration for Short Period ($S_s$): | 0.25 |
| Spectral Response Acceleration at 1.0 Second Period ($S_1$): | 0.07 |
| Importance Factor ($I_E$): | 1.00 |
| Site Coefficient $F_a$: | 1.60 |
| Site Coefficient $F_v$ | 2.40 |
| Response Modification Coefficient (R): | 1.50 |
| Design Spectral Response Acceleration at Short Period ($S_{ds}$): | 0.27 |
| Desing Spectral Response Acceleration at 1.0 Second Period ($S_{d1}$): | 0.11 |
| Period Based on Rayleigh Method (sec): | 2.43 |
| Redundancy Factor (p): | 1.30 |

**Load Case (1.2 + 0.2Sds) * DL + E EMAM** **Seismic Equivalent Modal Analysis Method**

| Segment | Height Above Base (ft) | Weight (lb) | a | b | c | Saz | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|---|---|
| 42 | 146.50 | 271 | 1.852 | 1.785 | 1.069 | 0.466 | 109 | 339 |
| 41 | 143.00 | 368 | 1.764 | 1.382 | 0.917 | 0.391 | 125 | 461 |
| 40 | 140.50 | 104 | 1.703 | 1.135 | 0.820 | 0.342 | 31 | 131 |
| 39 | 139.00 | 211 | 1.667 | 1.002 | 0.765 | 0.313 | 57 | 264 |
| 38 | 136.50 | 321 | 1.608 | 0.803 | 0.681 | 0.268 | 75 | 402 |
| 37 | 133.50 | 326 | 1.538 | 0.599 | 0.589 | 0.217 | 61 | 408 |
| 36 | 131.00 | 241 | 1.481 | 0.455 | 0.520 | 0.179 | 37 | 302 |
| 35 | 129.44 | 137 | 1.446 | 0.376 | 0.480 | 0.156 | 18 | 171 |
| 34 | 127.00 | 767 | 1.392 | 0.268 | 0.423 | 0.122 | 81 | 961 |
| 33 | 125.06 | 17 | 1.350 | 0.195 | 0.382 | 0.097 | 1 | 21 |
| 32 | 123.00 | 561 | 1.305 | 0.128 | 0.341 | 0.073 | 35 | 702 |
| 31 | 120.50 | 146 | 1.253 | 0.060 | 0.296 | 0.045 | 6 | 183 |
| 30 | 117.50 | 739 | 1.191 | -0.003 | 0.248 | 0.016 | 10 | 926 |
| 29 | 112.50 | 972 | 1.092 | -0.074 | 0.182 | -0.024 | -21 | 1,218 |
| 28 | 107.56 | 1,079 | 0.998 | -0.110 | 0.131 | -0.054 | -50 | 1,353 |
| 27 | 105.06 | 36 | 0.952 | -0.119 | 0.109 | -0.065 | -2 | 45 |
| 26 | 102.50 | 1,458 | 0.907 | -0.122 | 0.090 | -0.073 | -92 | 1,827 |
| 25 | 97.50 | 1,476 | 0.820 | -0.115 | 0.060 | -0.081 | -104 | 1,849 |
| 24 | 92.50 | 1,492 | 0.738 | -0.098 | 0.038 | -0.078 | -101 | 1,870 |
| 23 | 88.19 | 1,093 | 0.671 | -0.078 | 0.025 | -0.066 | -63 | 1,369 |
| 22 | 85.69 | 592 | 0.634 | -0.065 | 0.019 | -0.056 | -29 | 742 |
| 21 | 83.31 | 1,467 | 0.599 | -0.053 | 0.014 | -0.044 | -56 | 1,839 |
| 20 | 80.81 | 529 | 0.563 | -0.040 | 0.011 | -0.030 | -14 | 663 |
| 19 | 78.00 | 1,312 | 0.525 | -0.025 | 0.008 | -0.014 | -15 | 1,644 |
| 18 | 75.50 | 330 | 0.492 | -0.013 | 0.007 | 0.002 | 1 | 414 |
| 17 | 72.50 | 1,663 | 0.454 | 0.000 | 0.006 | 0.019 | 28 | 2,084 |
| 16 | 67.50 | 1,683 | 0.393 | 0.020 | 0.007 | 0.044 | 65 | 2,108 |
| 15 | 62.50 | 1,702 | 0.337 | 0.036 | 0.009 | 0.062 | 92 | 2,133 |
| 14 | 57.50 | 1,722 | 0.285 | 0.048 | 0.014 | 0.073 | 109 | 2,158 |
| 13 | 52.50 | 1,742 | 0.238 | 0.057 | 0.018 | 0.078 | 118 | 2,183 |
| 12 | 48.42 | 1,115 | 0.202 | 0.062 | 0.023 | 0.080 | 77 | 1,397 |
| 11 | 45.92 | 981 | 0.182 | 0.065 | 0.026 | 0.080 | 68 | 1,229 |
| 10 | 43.08 | 2,075 | 0.160 | 0.067 | 0.029 | 0.079 | 142 | 2,600 |
| 9 | 40.58 | 444 | 0.142 | 0.069 | 0.031 | 0.078 | 30 | 556 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 | 37.50 | 1,920 | 0.121 | 0.070 | 0.034 | 0.077 | 129 | 2,407 |
| 7 | 32.50 | 1,943 | 0.091 | 0.071 | 0.038 | 0.076 | 127 | 2,435 |
| 6 | 27.50 | 1,967 | 0.065 | 0.072 | 0.041 | 0.074 | 126 | 2,464 |
| 5 | 22.50 | 1,990 | 0.044 | 0.071 | 0.042 | 0.072 | 123 | 2,493 |
| 4 | 17.50 | 2,013 | 0.026 | 0.067 | 0.040 | 0.068 | 119 | 2,522 |
| 3 | 12.50 | 2,036 | 0.013 | 0.059 | 0.035 | 0.062 | 110 | 2,551 |
| 2 | 7.50 | 1,757 | 0.005 | 0.044 | 0.025 | 0.050 | 77 | 2,202 |
| 1 | 2.50 | 1,780 | 0.001 | 0.018 | 0.010 | 0.025 | 38 | 2,231 |
| Commscope ATSBT- | 159.00 | 5 | 2.181 | 3.897 | 1.781 | 0.782 | 4 | 7 |
| Andrew E15S09P94 | 159.00 | 44 | 2.181 | 3.897 | 1.781 | 0.782 | 30 | 55 |
| RFS ATMAP1412D-1A20 | 159.00 | 39 | 2.181 | 3.897 | 1.781 | 0.782 | 26 | 49 |
| Andrew SBNHH-1D65B | 159.00 | 152 | 2.181 | 3.897 | 1.781 | 0.782 | 103 | 191 |
| Powerwave Allgon LGP | 151.00 | 169 | 1.967 | 2.414 | 1.293 | 0.571 | 84 | 212 |
| Raycap DC6-48-60-18- | 151.00 | 40 | 1.967 | 2.414 | 1.293 | 0.571 | 20 | 50 |
| Ericsson RRUS 11 (Ba | 151.00 | 165 | 1.967 | 2.414 | 1.293 | 0.571 | 82 | 207 |
| Ericsson RRUS 32 | 151.00 | 152 | 1.967 | 2.414 | 1.293 | 0.571 | 75 | 191 |
| Ericsson RRUS 32 B2 | 151.00 | 159 | 1.967 | 2.414 | 1.293 | 0.571 | 79 | 199 |
| Powerwave Allgon 777 | 151.00 | 105 | 1.967 | 2.414 | 1.293 | 0.571 | 52 | 132 |
| Quintel QS66512-2 | 151.00 | 333 | 1.967 | 2.414 | 1.293 | 0.571 | 165 | 417 |
| CCI OPA-65R-LCUU-H6 | 151.00 | 219 | 1.967 | 2.414 | 1.293 | 0.571 | 108 | 274 |
| Flat Platform w/ Han | 151.00 | 2,000 | 1.967 | 2.414 | 1.293 | 0.571 | 990 | 2,506 |
| Pipe Mount | 148.00 | 200 | 1.890 | 1.980 | 1.140 | 0.500 | 87 | 251 |
| RFS FD9R6004 | 141.00 | 19 | 1.715 | 1.182 | 0.838 | 0.351 | 6 | 23 |
| Alcatel-Lucent RRH2x | 141.00 | 132 | 1.715 | 1.182 | 0.838 | 0.351 | 40 | 165 |
| Antel BXA-171063/8CF | 141.00 | 32 | 1.715 | 1.182 | 0.838 | 0.351 | 10 | 39 |
| Rymsa MGD3-800T0 | 141.00 | 59 | 1.715 | 1.182 | 0.838 | 0.351 | 18 | 74 |
| RFS DB-T1-6Z-8AB-0Z | 141.00 | 44 | 1.715 | 1.182 | 0.838 | 0.351 | 13 | 55 |
| Antel BXA-80063-6BF- | 141.00 | 19 | 1.715 | 1.182 | 0.838 | 0.351 | 6 | 24 |
| Antel BXA-70063/6CF | 141.00 | 17 | 1.715 | 1.182 | 0.838 | 0.351 | 5 | 21 |
| Antel BXA-70063/6CF | 141.00 | 45 | 1.715 | 1.182 | 0.838 | 0.351 | 14 | 56 |
| Antel BXA-80080/6CF | 141.00 | 22 | 1.715 | 1.182 | 0.838 | 0.351 | 7 | 28 |
| Flat Low Profile Pla | 141.00 | 1,500 | 1.715 | 1.182 | 0.838 | 0.351 | 457 | 1,880 |
| DragonWave Horizon C | 138.00 | 11 | 1.643 | 0.919 | 0.730 | 0.295 | 3 | 13 |
| NextNet BTS-2500 | 138.00 | 105 | 1.643 | 0.919 | 0.730 | 0.295 | 27 | 132 |
| Argus LLPX310R | 138.00 | 86 | 1.643 | 0.919 | 0.730 | 0.295 | 22 | 108 |
| DragonWave A-ANT-18G | 138.00 | 48 | 1.643 | 0.919 | 0.730 | 0.295 | 12 | 60 |
| Side Arms | 138.00 | 560 | 1.643 | 0.919 | 0.730 | 0.295 | 143 | 702 |
| KMW KMDAPS2040000 | 132.00 | 48 | 1.503 | 0.510 | 0.547 | 0.194 | 8 | 60 |
| KMW AM-X-WM-17-65- | 132.00 | 43 | 1.503 | 0.510 | 0.547 | 0.194 | 7 | 53 |
| Decibel DB844H90E-XY | 132.00 | 126 | 1.503 | 0.510 | 0.547 | 0.194 | 21 | 158 |
| Flat Low Profile Pla | 132.00 | 1,500 | 1.503 | 0.510 | 0.547 | 0.194 | 252 | 1,880 |
| Alcatel-Lucent 800 M | 121.00 | 192 | 1.263 | 0.073 | 0.305 | 0.051 | 8 | 241 |
| Alcatel-Lucent 4x40W | 121.00 | 273 | 1.263 | 0.073 | 0.305 | 0.051 | 12 | 342 |
| Alcatel-Lucent TD-RR | 121.00 | 210 | 1.263 | 0.073 | 0.305 | 0.051 | 9 | 263 |
| RFS APXVTM14-C-I20 | 121.00 | 159 | 1.263 | 0.073 | 0.305 | 0.051 | 7 | 199 |
| RFS APXVSPP18-C-A20 | 121.00 | 171 | 1.263 | 0.073 | 0.305 | 0.051 | 7 | 214 |
| Flat Low Profile Pla | 121.00 | 1,500 | 1.263 | 0.073 | 0.305 | 0.051 | 66 | 1,880 |
| Diamond X50A | 110.00 | 5 | 1.044 | -0.096 | 0.154 | -0.041 | 0 | 6 |
| Flat Side Arm | 110.00 | 300 | 1.044 | -0.096 | 0.154 | -0.041 | -11 | 376 |
| Antel BCD-87010 ___ | 100.00 | 26 | 0.863 | -0.120 | 0.074 | -0.079 | -2 | 33 |
| Flat Side Arm | 100.00 | 150 | 0.863 | -0.120 | 0.074 | -0.079 | -10 | 188 |
| PCTEL GPS-TMG-HR- | 76.00 | 1 | 0.498 | -0.016 | 0.007 | -0.001 | 0 | 1 |
| Round Side Arm | 76.00 | 150 | 0.498 | -0.016 | 0.007 | -0.001 | 0 | 188 |
| | | 55,908 | 103.398 | 65.883 | 45.074 | 17.787 | 4,738 | 70,060 |

**Load Case (0.9 - 0.2Sds) * DL + E EMAM** **Seismic (Reduced DL) Equivalent Modal Analysis Method**

| Segment | Height Above Base (ft) | Weight (lb) | a | b | c | Saz | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|---|---|

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 42 | 146.50 | 271 | 1.852 | 1.785 | 1.069 | 0.466 | 109 | 229 |
| 41 | 143.00 | 368 | 1.764 | 1.382 | 0.917 | 0.391 | 125 | 312 |
| 40 | 140.50 | 104 | 1.703 | 1.135 | 0.820 | 0.342 | 31 | 88 |
| 39 | 139.00 | 211 | 1.667 | 1.002 | 0.765 | 0.313 | 57 | 178 |
| 38 | 136.50 | 321 | 1.608 | 0.803 | 0.681 | 0.268 | 75 | 272 |
| 37 | 133.50 | 326 | 1.538 | 0.599 | 0.589 | 0.217 | 61 | 276 |
| 36 | 131.00 | 241 | 1.481 | 0.455 | 0.520 | 0.179 | 37 | 204 |
| 35 | 129.44 | 137 | 1.446 | 0.376 | 0.480 | 0.156 | 18 | 116 |
| 34 | 127.00 | 767 | 1.392 | 0.268 | 0.423 | 0.122 | 81 | 650 |
| 33 | 125.06 | 17 | 1.350 | 0.195 | 0.382 | 0.097 | 1 | 14 |
| 32 | 123.00 | 561 | 1.305 | 0.128 | 0.341 | 0.073 | 35 | 475 |
| 31 | 120.50 | 146 | 1.253 | 0.060 | 0.296 | 0.045 | 6 | 123 |
| 30 | 117.50 | 739 | 1.191 | -0.003 | 0.248 | 0.016 | 10 | 626 |
| 29 | 112.50 | 972 | 1.092 | -0.074 | 0.182 | -0.024 | -21 | 823 |
| 28 | 107.56 | 1,079 | 0.998 | -0.110 | 0.131 | -0.054 | -50 | 914 |
| 27 | 105.06 | 36 | 0.952 | -0.119 | 0.109 | -0.065 | -2 | 31 |
| 26 | 102.50 | 1,458 | 0.907 | -0.122 | 0.090 | -0.073 | -92 | 1,234 |
| 25 | 97.50 | 1,476 | 0.820 | -0.115 | 0.060 | -0.081 | -104 | 1,250 |
| 24 | 92.50 | 1,492 | 0.738 | -0.098 | 0.038 | -0.078 | -101 | 1,264 |
| 23 | 88.19 | 1,093 | 0.671 | -0.078 | 0.025 | -0.066 | -63 | 925 |
| 22 | 85.69 | 592 | 0.634 | -0.065 | 0.019 | -0.056 | -29 | 501 |
| 21 | 83.31 | 1,467 | 0.599 | -0.053 | 0.014 | -0.044 | -56 | 1,243 |
| 20 | 80.81 | 529 | 0.563 | -0.040 | 0.011 | -0.030 | -14 | 448 |
| 19 | 78.00 | 1,312 | 0.525 | -0.025 | 0.008 | -0.014 | -15 | 1,111 |
| 18 | 75.50 | 330 | 0.492 | -0.013 | 0.007 | 0.002 | 1 | 280 |
| 17 | 72.50 | 1,663 | 0.454 | 0.000 | 0.006 | 0.019 | 28 | 1,408 |
| 16 | 67.50 | 1,683 | 0.393 | 0.020 | 0.007 | 0.044 | 65 | 1,425 |
| 15 | 62.50 | 1,702 | 0.337 | 0.036 | 0.009 | 0.062 | 92 | 1,442 |
| 14 | 57.50 | 1,722 | 0.285 | 0.048 | 0.014 | 0.073 | 109 | 1,458 |
| 13 | 52.50 | 1,742 | 0.238 | 0.057 | 0.018 | 0.078 | 118 | 1,475 |
| 12 | 48.42 | 1,115 | 0.202 | 0.062 | 0.023 | 0.080 | 77 | 944 |
| 11 | 45.92 | 981 | 0.182 | 0.065 | 0.026 | 0.080 | 68 | 831 |
| 10 | 43.08 | 2,075 | 0.160 | 0.067 | 0.029 | 0.079 | 142 | 1,757 |
| 9 | 40.58 | 444 | 0.142 | 0.069 | 0.031 | 0.078 | 30 | 376 |
| 8 | 37.50 | 1,920 | 0.121 | 0.070 | 0.034 | 0.077 | 129 | 1,626 |
| 7 | 32.50 | 1,943 | 0.091 | 0.071 | 0.038 | 0.076 | 127 | 1,646 |
| 6 | 27.50 | 1,967 | 0.065 | 0.072 | 0.041 | 0.074 | 126 | 1,665 |
| 5 | 22.50 | 1,990 | 0.044 | 0.071 | 0.042 | 0.072 | 123 | 1,685 |
| 4 | 17.50 | 2,013 | 0.026 | 0.067 | 0.040 | 0.068 | 119 | 1,704 |
| 3 | 12.50 | 2,036 | 0.013 | 0.059 | 0.035 | 0.062 | 110 | 1,724 |
| 2 | 7.50 | 1,757 | 0.005 | 0.044 | 0.025 | 0.050 | 77 | 1,488 |
| 1 | 2.50 | 1,780 | 0.001 | 0.018 | 0.010 | 0.025 | 38 | 1,508 |
| Commscope ATSBT- | 159.00 | 5 | 2.181 | 3.897 | 1.781 | 0.782 | 4 | 5 |
| Andrew E15S09P94 | 159.00 | 44 | 2.181 | 3.897 | 1.781 | 0.782 | 30 | 37 |
| RFS ATMAP1412D-1A20 | 159.00 | 39 | 2.181 | 3.897 | 1.781 | 0.782 | 26 | 33 |
| Andrew SBNHH-1D65B | 159.00 | 152 | 2.181 | 3.897 | 1.781 | 0.782 | 103 | 129 |
| Powerwave Allgon LGP | 151.00 | 169 | 1.967 | 2.414 | 1.293 | 0.571 | 84 | 143 |
| Raycap DC6-48-60-18- | 151.00 | 40 | 1.967 | 2.414 | 1.293 | 0.571 | 20 | 34 |
| Ericsson RRUS 11 (Ba | 151.00 | 165 | 1.967 | 2.414 | 1.293 | 0.571 | 82 | 140 |
| Ericsson RRUS 32 | 151.00 | 152 | 1.967 | 2.414 | 1.293 | 0.571 | 75 | 129 |
| Ericsson RRUS 32 B2 | 151.00 | 159 | 1.967 | 2.414 | 1.293 | 0.571 | 79 | 135 |
| Powerwave Allgon 777 | 151.00 | 105 | 1.967 | 2.414 | 1.293 | 0.571 | 52 | 89 |
| Quintel QS66512-2 | 151.00 | 333 | 1.967 | 2.414 | 1.293 | 0.571 | 165 | 282 |
| CCI OPA-65R-LCUU-H6 | 151.00 | 219 | 1.967 | 2.414 | 1.293 | 0.571 | 108 | 185 |
| Flat Platform w/ Han | 151.00 | 2,000 | 1.967 | 2.414 | 1.293 | 0.571 | 990 | 1,694 |
| Pipe Mount | 148.00 | 200 | 1.890 | 1.980 | 1.140 | 0.500 | 87 | 169 |
| RFS FD9R6004 | 141.00 | 19 | 1.715 | 1.182 | 0.838 | 0.351 | 6 | 16 |
| Alcatel-Lucent RRH2x | 141.00 | 132 | 1.715 | 1.182 | 0.838 | 0.351 | 40 | 112 |
| Antel BXA-171063/8CF | 141.00 | 32 | 1.715 | 1.182 | 0.838 | 0.351 | 10 | 27 |
| Rymsa MGD3-800T0 | 141.00 | 59 | 1.715 | 1.182 | 0.838 | 0.351 | 18 | 50 |
| RFS DB-T1-6Z-8AB-0Z | 141.00 | 44 | 1.715 | 1.182 | 0.838 | 0.351 | 13 | 37 |
| Antel BXA-80063-6BF- | 141.00 | 19 | 1.715 | 1.182 | 0.838 | 0.351 | 6 | 16 |
| Antel BXA-70063/6CF | 141.00 | 17 | 1.715 | 1.182 | 0.838 | 0.351 | 5 | 14 |
| Antel BXA-70063/6CF | 141.00 | 45 | 1.715 | 1.182 | 0.838 | 0.351 | 14 | 38 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Antel BXA-80080/6CF | 141.00 | 22 | 1.715 | 1.182 | 0.838 | 0.351 | 7 | 19 |
| Flat Low Profile Pla | 141.00 | 1,500 | 1.715 | 1.182 | 0.838 | 0.351 | 457 | 1,270 |
| DragonWave Horizon C | 138.00 | 11 | 1.643 | 0.919 | 0.730 | 0.295 | 3 | 9 |
| NextNet BTS-2500 | 138.00 | 105 | 1.643 | 0.919 | 0.730 | 0.295 | 27 | 89 |
| Argus LLPX310R | 138.00 | 86 | 1.643 | 0.919 | 0.730 | 0.295 | 22 | 73 |
| DragonWave A-ANT-18G | 138.00 | 48 | 1.643 | 0.919 | 0.730 | 0.295 | 12 | 40 |
| Side Arms | 138.00 | 560 | 1.643 | 0.919 | 0.730 | 0.295 | 143 | 474 |
| KMW KMDAPS2040000 | 132.00 | 48 | 1.503 | 0.510 | 0.547 | 0.194 | 8 | 40 |
| KMW AM-X-WM-17-65- | 132.00 | 43 | 1.503 | 0.510 | 0.547 | 0.194 | 7 | 36 |
| Decibel DB844H90E-XY | 132.00 | 126 | 1.503 | 0.510 | 0.547 | 0.194 | 21 | 107 |
| Flat Low Profile Pla | 132.00 | 1,500 | 1.503 | 0.510 | 0.547 | 0.194 | 252 | 1,270 |
| Alcatel-Lucent 800 M | 121.00 | 192 | 1.263 | 0.073 | 0.305 | 0.051 | 8 | 163 |
| Alcatel-Lucent 4x40W | 121.00 | 273 | 1.263 | 0.073 | 0.305 | 0.051 | 12 | 231 |
| Alcatel-Lucent TD-RR | 121.00 | 210 | 1.263 | 0.073 | 0.305 | 0.051 | 9 | 178 |
| RFS APXVTM14-C-I20 | 121.00 | 159 | 1.263 | 0.073 | 0.305 | 0.051 | 7 | 134 |
| RFS APXVSPP18-C-A20 | 121.00 | 171 | 1.263 | 0.073 | 0.305 | 0.051 | 7 | 145 |
| Flat Low Profile Pla | 121.00 | 1,500 | 1.263 | 0.073 | 0.305 | 0.051 | 66 | 1,270 |
| Diamond X50A | 110.00 | 5 | 1.044 | -0.096 | 0.154 | -0.041 | 0 | 4 |
| Flat Side Arm | 110.00 | 300 | 1.044 | -0.096 | 0.154 | -0.041 | -11 | 254 |
| Antel BCD-87010 ___ | 100.00 | 26 | 0.863 | -0.120 | 0.074 | -0.079 | -2 | 22 |
| Flat Side Arm | 100.00 | 150 | 0.863 | -0.120 | 0.074 | -0.079 | -10 | 127 |
| PCTEL GPS-TMG-HR- | 76.00 | 1 | 0.498 | -0.016 | 0.007 | -0.001 | 0 | 1 |
| Round Side Arm | 76.00 | 150 | 0.498 | -0.016 | 0.007 | -0.001 | 0 | 127 |
| | | 55,908 | 103.398 | 65.883 | 45.074 | 17.787 | 4,738 | 47,348 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


## Load Case (1.2 + 0.2Sds) * DL + E EMAM Seismic Equivalent Modal Analysis Method

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -63.34 | -2.89 | 0.00 | -273.73 | 0.00 | 273.73 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.052 |
| 5.00 | -61.14 | -2.83 | 0.00 | -259.27 | 0.00 | 259.27 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.01 | -0.01 | 0.051 |
| 10.00 | -58.58 | -2.73 | 0.00 | -245.13 | 0.00 | 245.13 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.03 | -0.03 | 0.050 |
| 15.00 | -56.06 | -2.63 | 0.00 | -231.46 | 0.00 | 231.46 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.07 | -0.04 | 0.048 |
| 20.00 | -53.57 | -2.51 | 0.00 | -218.33 | 0.00 | 218.33 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 0.12 | -0.06 | 0.047 |
| 25.00 | -51.10 | -2.40 | 0.00 | -205.76 | 0.00 | 205.76 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 0.19 | -0.07 | 0.045 |
| 30.00 | -48.67 | -2.28 | 0.00 | -193.77 | 0.00 | 193.77 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 0.27 | -0.09 | 0.044 |
| 35.00 | -46.26 | -2.16 | 0.00 | -182.38 | 0.00 | 182.38 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 0.37 | -0.10 | 0.043 |
| 40.00 | -45.71 | -2.13 | 0.00 | -171.58 | 0.00 | 171.58 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 0.48 | -0.12 | 0.043 |
| 41.16 | -43.10 | -1.99 | 0.00 | -169.10 | 0.00 | 169.10 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 0.51 | -0.12 | 0.042 |
| 45.00 | -41.88 | -1.93 | 0.00 | -161.45 | 0.00 | 161.45 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 0.61 | -0.13 | 0.041 |
| 46.83 | -40.48 | -1.85 | 0.00 | -157.93 | 0.00 | 157.93 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 0.66 | -0.13 | 0.045 |
| 50.00 | -38.30 | -1.74 | 0.00 | -152.05 | 0.00 | 152.05 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 0.76 | -0.14 | 0.044 |
| 55.00 | -36.14 | -1.63 | 0.00 | -143.36 | 0.00 | 143.36 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 0.92 | -0.16 | 0.042 |
| 60.00 | -34.01 | -1.54 | 0.00 | -135.19 | 0.00 | 135.19 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 1.09 | -0.17 | 0.041 |
| 65.00 | -31.90 | -1.48 | 0.00 | -127.47 | 0.00 | 127.47 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 1.28 | -0.19 | 0.040 |
| 70.00 | -29.81 | -1.45 | 0.00 | -120.06 | 0.00 | 120.06 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 1.49 | -0.21 | 0.039 |
| 75.00 | -29.40 | -1.46 | 0.00 | -112.79 | 0.00 | 112.79 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 1.71 | -0.22 | 0.038 |
| 76.00 | -27.57 | -1.47 | 0.00 | -111.33 | 0.00 | 111.33 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 1.76 | -0.22 | 0.038 |
| 80.00 | -26.90 | -1.49 | 0.00 | -105.45 | 0.00 | 105.45 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 1.95 | -0.24 | 0.037 |
| 81.62 | -25.06 | -1.54 | 0.00 | -103.04 | 0.00 | 103.04 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 2.03 | -0.24 | 0.037 |
| 85.00 | -24.32 | -1.57 | 0.00 | -97.85 | 0.00 | 97.85 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 2.21 | -0.25 | 0.035 |
| 86.37 | -22.95 | -1.63 | 0.00 | -95.70 | 0.00 | 95.70 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 2.28 | -0.26 | 0.038 |
| 90.00 | -21.08 | -1.72 | 0.00 | -89.81 | 0.00 | 89.81 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 2.48 | -0.27 | 0.037 |
| 95.00 | -19.23 | -1.82 | 0.00 | -81.19 | 0.00 | 81.19 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 2.77 | -0.28 | 0.034 |
| 100.00 | -17.18 | -1.92 | 0.00 | -72.07 | 0.00 | 72.07 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 3.08 | -0.30 | 0.032 |
| 105.00 | -17.14 | -1.93 | 0.00 | -62.47 | 0.00 | 62.47 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 3.40 | -0.31 | 0.029 |
| 105.13 | -15.78 | -1.97 | 0.00 | -62.22 | 0.00 | 62.22 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 3.41 | -0.31 | 0.029 |
| 105.13 | -15.78 | -1.97 | 0.00 | -62.22 | 0.00 | 62.22 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 3.41 | -0.31 | 0.058 |
| 110.00 | -14.18 | -2.00 | 0.00 | -52.62 | 0.00 | 52.62 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 3.74 | -0.33 | 0.053 |
| 115.00 | -13.25 | -1.99 | 0.00 | -42.63 | 0.00 | 42.63 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 4.09 | -0.35 | 0.047 |
| 120.00 | -13.07 | -1.98 | 0.00 | -32.69 | 0.00 | 32.69 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 4.48 | -0.38 | 0.040 |
| 121.00 | -9.23 | -1.82 | 0.00 | -30.71 | 0.00 | 30.71 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 4.56 | -0.38 | 0.036 |
| 125.00 | -9.21 | -1.81 | 0.00 | -23.45 | 0.00 | 23.45 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 4.88 | -0.40 | 0.031 |
| 125.12 | -8.25 | -1.73 | 0.00 | -23.22 | 0.00 | 23.22 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 4.89 | -0.40 | 0.030 |
| 128.87 | -8.08 | -1.71 | 0.00 | -16.74 | 0.00 | 16.74 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 5.21 | -0.41 | 0.029 |
| 130.00 | -7.78 | -1.67 | 0.00 | -14.82 | 0.00 | 14.82 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 5.30 | -0.41 | 0.026 |
| 132.00 | -5.22 | -1.30 | 0.00 | -11.48 | 0.00 | 11.48 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 5.48 | -0.42 | 0.020 |
| 135.00 | -4.82 | -1.23 | 0.00 | -7.57 | 0.00 | 7.57 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 5.74 | -0.42 | 0.015 |
| 138.00 | -3.54 | -0.95 | 0.00 | -3.89 | 0.00 | 3.89 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 6.01 | -0.43 | 0.009 |
| 140.00 | -3.41 | -0.92 | 0.00 | -1.99 | 0.00 | 1.99 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 6.18 | -0.43 | 0.006 |
| 141.00 | -0.59 | -0.20 | 0.00 | -1.07 | 0.00 | 1.07 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 6.27 | -0.43 | 0.002 |
| 145.00 | -0.25 | -0.09 | 0.00 | -0.27 | 0.00 | 0.27 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 6.63 | -0.43 | 0.001 |
| 148.00 | 0.00 | -0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 6.90 | -0.43 | 0.000 |

 © 2007 - 2016 by ATC IP LLC. All rights reserved.


## Load Case (0.9 - 0.2Sds) * DL + E EMAM Seismic (Reduced DL) Equivalent Modal Analysis Method

## Calculated Forces

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -42.81 | -2.89 | 0.00 | -269.99 | 0.00 | 269.99 | 4,773.35 | 2,386.68 | 9,316.44 | 4,665.14 | 0.00 | 0.00 | 0.048 |
| 5.00 | -41.32 | -2.82 | 0.00 | -255.55 | 0.00 | 255.55 | 4,702.37 | 2,351.19 | 8,987.95 | 4,500.66 | 0.01 | -0.01 | 0.047 |
| 10.00 | -39.59 | -2.72 | 0.00 | -241.44 | 0.00 | 241.44 | 4,630.27 | 2,315.13 | 8,663.09 | 4,337.98 | 0.03 | -0.03 | 0.046 |
| 15.00 | -37.89 | -2.61 | 0.00 | -227.84 | 0.00 | 227.84 | 4,557.03 | 2,278.52 | 8,341.98 | 4,177.19 | 0.07 | -0.04 | 0.045 |
| 20.00 | -36.20 | -2.49 | 0.00 | -214.79 | 0.00 | 214.79 | 4,482.67 | 2,241.34 | 8,024.78 | 4,018.36 | 0.12 | -0.06 | 0.043 |
| 25.00 | -34.54 | -2.37 | 0.00 | -202.33 | 0.00 | 202.33 | 4,403.56 | 2,201.78 | 7,705.28 | 3,858.37 | 0.19 | -0.07 | 0.042 |
| 30.00 | -32.89 | -2.25 | 0.00 | -190.45 | 0.00 | 190.45 | 4,302.92 | 2,151.46 | 7,355.37 | 3,683.15 | 0.27 | -0.09 | 0.041 |
| 35.00 | -31.26 | -2.13 | 0.00 | -179.19 | 0.00 | 179.19 | 4,202.28 | 2,101.14 | 7,013.59 | 3,512.01 | 0.37 | -0.10 | 0.040 |
| 40.00 | -30.89 | -2.10 | 0.00 | -168.54 | 0.00 | 168.54 | 4,101.65 | 2,050.82 | 6,679.95 | 3,344.94 | 0.48 | -0.11 | 0.039 |
| 41.16 | -29.13 | -1.96 | 0.00 | -166.09 | 0.00 | 166.09 | 4,078.23 | 2,039.12 | 6,603.48 | 3,306.65 | 0.51 | -0.12 | 0.039 |
| 45.00 | -28.30 | -1.90 | 0.00 | -158.57 | 0.00 | 158.57 | 4,001.01 | 2,000.51 | 6,354.43 | 3,181.94 | 0.60 | -0.13 | 0.038 |
| 46.83 | -27.36 | -1.82 | 0.00 | -155.10 | 0.00 | 155.10 | 3,410.94 | 1,705.47 | 5,490.25 | 2,749.21 | 0.65 | -0.13 | 0.041 |
| 50.00 | -25.88 | -1.70 | 0.00 | -149.33 | 0.00 | 149.33 | 3,371.32 | 1,685.66 | 5,340.15 | 2,674.05 | 0.74 | -0.14 | 0.040 |
| 55.00 | -24.42 | -1.60 | 0.00 | -140.81 | 0.00 | 140.81 | 3,307.92 | 1,653.96 | 5,106.10 | 2,556.85 | 0.90 | -0.16 | 0.039 |
| 60.00 | -22.98 | -1.51 | 0.00 | -132.82 | 0.00 | 132.82 | 3,242.50 | 1,621.25 | 4,874.14 | 2,440.69 | 1.07 | -0.17 | 0.038 |
| 65.00 | -21.55 | -1.44 | 0.00 | -125.28 | 0.00 | 125.28 | 3,156.24 | 1,578.12 | 4,616.98 | 2,311.92 | 1.26 | -0.19 | 0.037 |
| 70.00 | -20.15 | -1.42 | 0.00 | -118.05 | 0.00 | 118.05 | 3,069.98 | 1,534.99 | 4,366.78 | 2,186.64 | 1.46 | -0.20 | 0.036 |
| 75.00 | -19.87 | -1.42 | 0.00 | -110.97 | 0.00 | 110.97 | 2,983.72 | 1,491.86 | 4,123.56 | 2,064.84 | 1.68 | -0.22 | 0.036 |
| 76.00 | -18.63 | -1.43 | 0.00 | -109.55 | 0.00 | 109.55 | 2,966.47 | 1,483.23 | 4,075.75 | 2,040.91 | 1.73 | -0.22 | 0.035 |
| 80.00 | -18.18 | -1.45 | 0.00 | -103.82 | 0.00 | 103.82 | 2,897.46 | 1,448.73 | 3,887.31 | 1,946.54 | 1.92 | -0.23 | 0.035 |
| 81.62 | -16.94 | -1.50 | 0.00 | -101.47 | 0.00 | 101.47 | 2,869.45 | 1,434.73 | 3,812.10 | 1,908.88 | 2.00 | -0.24 | 0.034 |
| 85.00 | -16.43 | -1.53 | 0.00 | -96.40 | 0.00 | 96.40 | 2,811.20 | 1,405.60 | 3,658.02 | 1,831.73 | 2.17 | -0.25 | 0.033 |
| 86.37 | -15.51 | -1.59 | 0.00 | -94.30 | 0.00 | 94.30 | 2,342.68 | 1,171.34 | 3,095.01 | 1,549.81 | 2.24 | -0.25 | 0.036 |
| 90.00 | -14.24 | -1.69 | 0.00 | -88.53 | 0.00 | 88.53 | 2,304.43 | 1,152.21 | 2,976.95 | 1,490.69 | 2.44 | -0.26 | 0.034 |
| 95.00 | -12.99 | -1.79 | 0.00 | -80.09 | 0.00 | 80.09 | 2,249.56 | 1,124.78 | 2,815.20 | 1,409.69 | 2.73 | -0.28 | 0.032 |
| 100.00 | -11.61 | -1.89 | 0.00 | -71.13 | 0.00 | 71.13 | 2,177.68 | 1,088.84 | 2,637.27 | 1,320.60 | 3.03 | -0.29 | 0.030 |
| 105.00 | -11.58 | -1.89 | 0.00 | -61.68 | 0.00 | 61.68 | 2,105.79 | 1,052.90 | 2,465.16 | 1,234.41 | 3.34 | -0.31 | 0.027 |
| 105.13 | -10.66 | -1.94 | 0.00 | -61.44 | 0.00 | 61.44 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 3.35 | -0.31 | 0.027 |
| 105.13 | -10.66 | -1.94 | 0.00 | -61.44 | 0.00 | 61.44 | 2,103.99 | 1,052.00 | 2,460.93 | 1,232.29 | 3.35 | -0.31 | 0.055 |
| 110.00 | -9.58 | -1.97 | 0.00 | -51.98 | 0.00 | 51.98 | 2,033.91 | 1,016.95 | 2,298.85 | 1,151.13 | 3.68 | -0.32 | 0.050 |
| 115.00 | -8.95 | -1.96 | 0.00 | -42.13 | 0.00 | 42.13 | 1,962.02 | 981.01 | 2,138.35 | 1,070.76 | 4.03 | -0.35 | 0.044 |
| 120.00 | -8.83 | -1.95 | 0.00 | -32.34 | 0.00 | 32.34 | 1,890.14 | 945.07 | 1,983.66 | 993.30 | 4.40 | -0.37 | 0.037 |
| 121.00 | -6.24 | -1.79 | 0.00 | -30.38 | 0.00 | 30.38 | 1,875.76 | 937.88 | 1,953.41 | 978.16 | 4.48 | -0.37 | 0.034 |
| 125.00 | -6.22 | -1.79 | 0.00 | -23.21 | 0.00 | 23.21 | 1,818.26 | 909.13 | 1,834.77 | 918.75 | 4.80 | -0.39 | 0.029 |
| 125.12 | -5.57 | -1.71 | 0.00 | -22.98 | 0.00 | 22.98 | 1,816.48 | 908.24 | 1,831.17 | 916.95 | 4.81 | -0.39 | 0.028 |
| 128.87 | -5.46 | -1.69 | 0.00 | -16.58 | 0.00 | 16.58 | 1,443.09 | 721.55 | 1,448.31 | 725.23 | 5.12 | -0.40 | 0.027 |
| 130.00 | -5.25 | -1.65 | 0.00 | -14.67 | 0.00 | 14.67 | 1,430.26 | 715.13 | 1,422.41 | 712.26 | 5.22 | -0.40 | 0.024 |
| 132.00 | -3.52 | -1.29 | 0.00 | -11.37 | 0.00 | 11.37 | 1,407.26 | 703.63 | 1,376.79 | 689.42 | 5.39 | -0.41 | 0.019 |
| 135.00 | -3.25 | -1.21 | 0.00 | -7.50 | 0.00 | 7.50 | 1,372.75 | 686.38 | 1,309.76 | 655.86 | 5.65 | -0.42 | 0.014 |
| 138.00 | -2.39 | -0.94 | 0.00 | -3.86 | 0.00 | 3.86 | 1,338.25 | 669.12 | 1,244.41 | 623.13 | 5.91 | -0.42 | 0.008 |
| 140.00 | -2.30 | -0.91 | 0.00 | -1.97 | 0.00 | 1.97 | 1,315.24 | 657.62 | 1,201.77 | 601.78 | 6.09 | -0.42 | 0.005 |
| 141.00 | -0.40 | -0.20 | 0.00 | -1.06 | 0.00 | 1.06 | 1,303.74 | 651.87 | 1,180.73 | 591.24 | 6.18 | -0.42 | 0.002 |
| 145.00 | -0.17 | -0.09 | 0.00 | -0.26 | 0.00 | 0.26 | 1,257.74 | 628.87 | 1,098.42 | 550.03 | 6.53 | -0.42 | 0.001 |
| 148.00 | 0.00 | -0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 1,223.23 | 611.62 | 1,038.64 | 520.09 | 6.79 | -0.42 | 0.000 |

© 2007 - 2016 by ATC IP LLC. All rights reserved.


## Analysis Summary

| Load Case | Reactions Shear FX (kips) | Shear FZ (kips) | Axial FY (kips) | Moment MX (ft-kips) | Moment MY (ft-kips) | Moment MZ (ft-kips) | Max Usage Elev (ft) | Interaction Ratio |
|---|---|---|---|---|---|---|---|---|
| 1.2D + 1.6W | 24.48 | 0.00 | 67.06 | 0.00 | 0.00 | 2852.09 | 105.13 | 0.46 |
| 0.9D + 1.6W | 23.08 | 0.00 | 50.29 | 0.00 | 0.00 | 2688.76 | 105.13 | 0.44 |
| 1.2D + 1.0Di + 1.0Wi | 6.83 | 0.00 | 100.57 | 0.00 | 0.00 | 795.36 | 105.13 | 0.14 |
| (1.2 + 0.2Sds) * DL + E ELFM | 1.80 | 0.00 | 63.34 | 0.00 | 0.00 | 202.14 | 0.00 | 0.04 |
| (1.2 + 0.2Sds) * DL + E EMAM | 2.89 | 0.00 | 63.34 | 0.00 | 0.00 | 273.73 | 105.13 | 0.06 |
| (0.9 - 0.2Sds) * DL + E ELFM | 1.80 | 0.00 | 42.81 | 0.00 | 0.00 | 199.50 | 0.00 | 0.04 |
| (0.9 - 0.2Sds) * DL + E EMAM | 2.89 | 0.00 | 42.81 | 0.00 | 0.00 | 269.99 | 105.13 | 0.05 |
| 1.0D + 1.0W | 6.00 | 0.00 | 55.91 | 0.00 | 0.00 | 702.98 | 105.13 | 0.12 |

## Additional Steel Summary

| Elev From (ft) | Elev To (ft) | Member | Intermediate Connectors VQ/I (lb/in) | Shear Applied (kips) | Shear phiVn (kips) | Upper Termination Connectors MQ/I (kips) | phiVn (kips) | Num Reqd | Num Actual | Lower Termination Connectors MQ/I (kips) | phiVn (kips) | Num Reqd | Num Actual | Max Member Pu (kip) | phiPn (kip) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 105. | (4) SOL-#20 All Thre | 255.3 | 7.7 | 16.8 | 96.3 | 12.0 | 9 | 24 | 0.0 | 12.0 | 0 | 0 | 179.3 | 330.5 | 0.543 |

| | | | |
|---|---|---|---|
| Base/Flange Plate | Plate Type | ***Baseplate*** | |
| | Pole Diameter | 48 | in |
| | Pole Thickness | 0.4375 | in |
| | Plate Diameter | 63 | in |
| | Plate Thickness | 2 | in |
| | Plate Fy | 60 | ksi |
| | Weld Length | 0.3125 | in |
| | $\phi_s$ Resistance | 1480.94 | k-in |
| | Applied | 320.07 | k-in |
| Stiffeners | # | ***16*** | ***Show*** |
| | Thickness | 0.75 | in |
| | Length | 6 | in |
| | Height | 12 | in |
| | Chamfer | 1 | in |
| | Offset Angle | 22.5 | ° |
| | Fy | 36 | ksi |

| | | | |
|---|---|---|---|
| Bolts | # | ***16*** | |
| | Bolt Circle | 57 | in |
| | (R)adial / (S)quare | R | |
| | Diameter | 2.25 | in |
| | Hole Diameter | 2.625 | in |
| | Type | A615-75 | |
| | Fy | 75 | ksi |
| | Fu | 100 | ksi |
| | $\phi_s$ Resistance | 259.82 | k |
| | Applied | 111.33 | k |
| Reinforcement ● | # | ***4*** | |
| | DYW. Circle | 54.875 | in |
| | Offset Angle | 15 | ° |
| | Type | #20 | |
| | Diameter | 2.5 | in |
| | Fu | 100 | ksi |
| | $\phi_s$ Resistance | 392.70 | k |
| | Applied | 172.01 | k |
| Extra Bolts O | # | ***0*** | |

| | |
|---|---|
| Code Rev. | ***G*** |
| Moment | 2852.1 k-ft |
| Axial | 67.1 k |

| | |
|---|---|
| **Date** | 8/30/2016 |
| **Engineer** | TJG |
| **Site #** | 302515 |
| **Carrier** | T-Mobile |

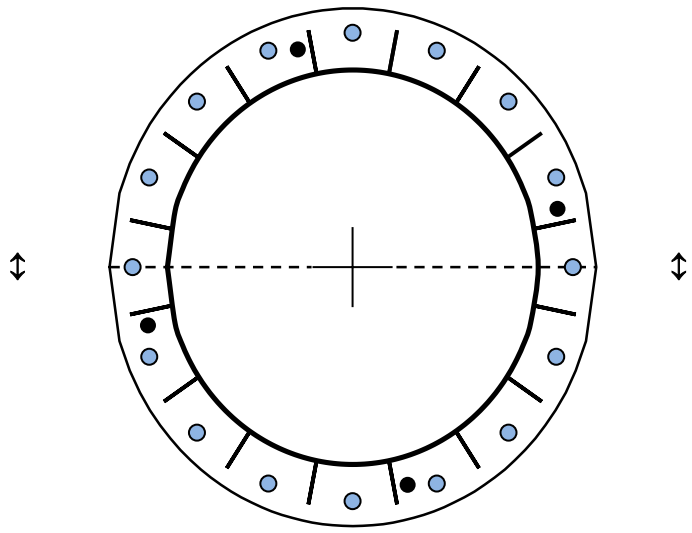
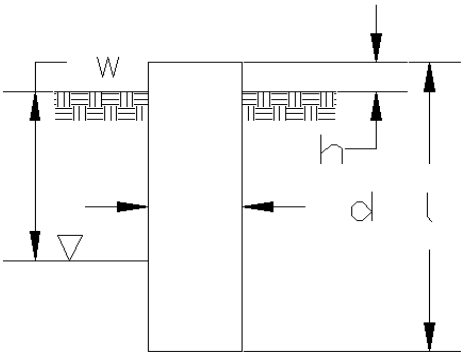


Plate Stress Ratio:
0.22 (Pass)

Bolt Stress Ratio:
0.43 (Pass)

Reinforcement Stress Ratio:
0.44 (Pass)

| | | | |
|---|---|---|---|
| Site Name: | SMFR - North, CT | *Program Last Updated:* | *5/13/2014* |
| Site Number: | 302515 | *American Tower Corporation* | |
| Engineer: | TJG | | |
| Engineering Number: | OAA687796_C3_02 | | |
| Date: | 11/02/16 | | |




**Design Base Loads (Factored) - Analysis per TIA-222-G Standards**

| | | |
|---|---|---|
| Analyze or Design a Foundation? | Analyze | |
| Foundation Mapped: | N | |
| Moment (M): | 2852.1 | k-ft |
| Shear/Leg (V): | 24.5 | k |
| Axial Load (P): | 67.1 | k |
| Uplift/Leg (U): | 0.0 | k |
| Tower Type (GT / SST / MP): | MP | |
| Diameter of Caisson (d): | 6.5 | ft |
| Caisson Embedment (L-h): | 24.0 | ft |
| Caisson Height Above Ground (h): | 1.0 | ft |
| Depth Below Ground Surface to Water Table (w): | 22.0 | ft |
| Unit Weight of Concrete: | 150.0 | pcf |
| Unit Weight of Water: | 62.4 | pcf |
| Tension Skin Friction/Compression Skin Friction: | 1.00 | |
| Pullout Angle: | 30.0 | degrees |

Engineer Notes

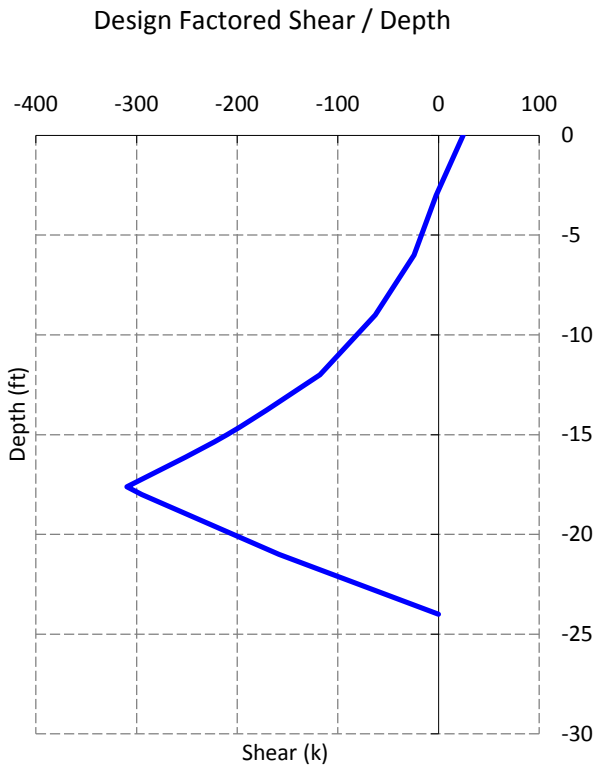
**Soil Mechanical Properties**

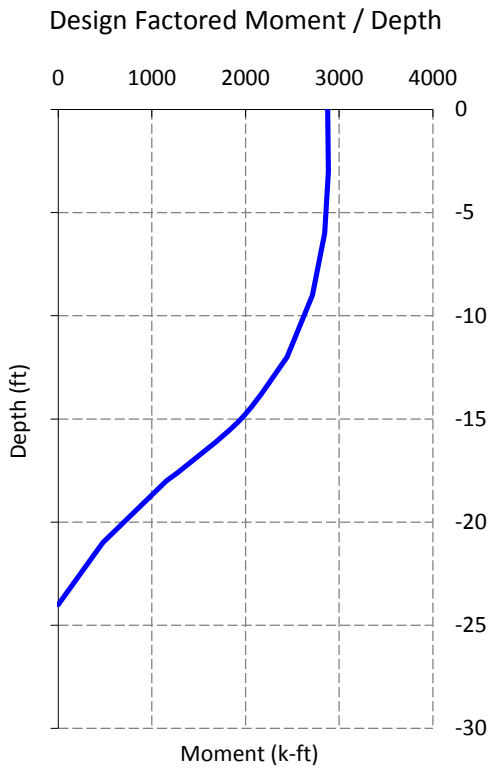
| Depth (ft) Top | Depth (ft) Bottom | $\gamma_{Soil}$ (pcf) | Cohesion (psf) | $\phi$ (degree) | Ultimate Skin Friction (psf) | Ultimate Bearing Pressure (psf) |
|---|---|---|---|---|---|---|
| 0.0 | 2.0 | 100 | 0 | 0 | 0 | 0 |
| 2.0 | 10.0 | 120 | 0 | 30 | 400 | 0 |
| 10.0 | 25.0 | 125 | 0 | 36 | 1400 | 40000 |

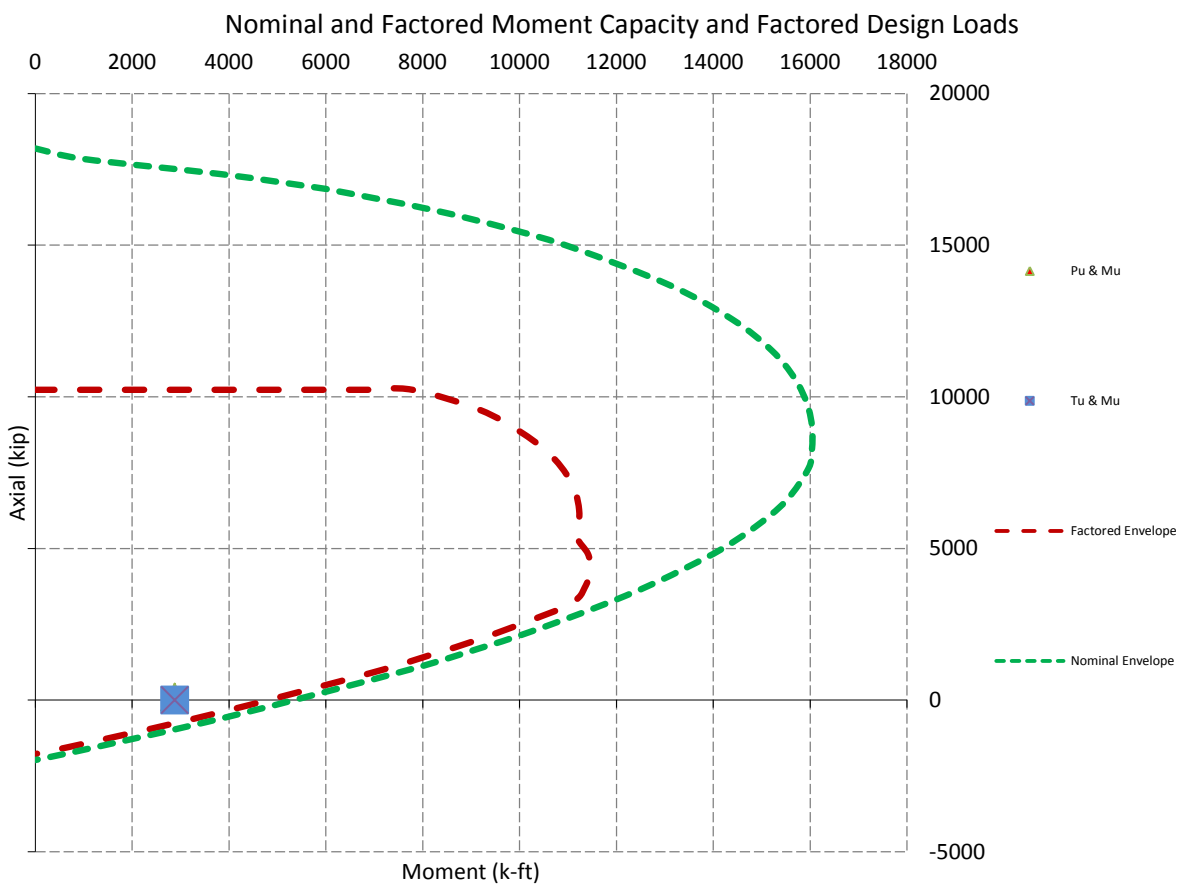
| | | |
|---|---|---|
| Required Embedment: | 19.6 | ft - OK, Caisson Embedment Satisfactory |
| Volume of Concrete: | 829.6 | $ft^3$ = 30.7 $yd^3$ |
| Weight of Concrete (Buoyancy Effect Considered): | 120.3 | k |
| Average Soil Unit Weight: | 114.0 | pcf |
| Skin Friction Resistance: | 465.6 | k |
| Compressive Bearing Resistance: | 1327.3 | k |
| Pullout Weight (Minus Concrete Weight): | 936.9 | k |
| Nominal Uplift Capacity per Leg ($\phi_s T_n$): | 439.4 | k |
| Nominal Compressive Capacity per Leg ($\phi_s P_n$): | 1344.7 | k |
| $P_u$: | 96.5 | k |
| $T_u/\phi_s T_n$: | 0.00 | Result: OK |
| $P_u/\phi_s P_n$: | 0.07 | Result: OK |
| Total Lateral Resistance: | 2023.1 | k |
| Inflection Point (Below Ground Surface): | 17.6 | ft |
| Design Overturning Moment At Inflection Point ($M_D$): | 3307.7 | k-ft |
| Nominal Moment Capacity ($\phi_s M_n$): | 6494.1 | k-ft |
| $M_D/\phi_s M_n$: | 0.51 | Result: OK |
| $\phi_s$: | 0.75 | |

**Caisson Strength Capacity**

| | | |
|---|---|---|
| Concrete Compressive Strength ($f'_c$): | 4000 | psi |
| Vertical Steel Rebar Size #: | 11 | |
| Vertical Steel Rebar Area: | 1.56 | $in^2$ |
| # of Vertical Steel Rebars: | 21 | |
| Vertical Steel Rebar Yield Strength ($F_y$): | 60 | ksi |
| Horizontal Tie / Stirrup Size #: | 5 | |
| Horizontal Tie / Stirrup Area: | 0.31 | $in^2$ |
| Design Horizontal Tie / Stirrup Spacing: | 12.0 | in |
| Horizontal Tie / Stirrup Steel Yield Strength ($F_y$): | 60 | ksi |
| Rebar Cage Diameter: | 70.0 | in |
| Strength Bending/Tension Reduction Factor ($\phi_B$): | 0.90 | ACI318-05 - 9.3.2.1 |
| Strength Shear Reduction Factor ($\phi_V$): | 0.75 | ACI318-05 - 9.3.2.3 |
| Strength Compression Reduction Factor ($\phi_V$): | 0.65 | ACI318-05 - 9.3.2.2 |
| Steel Elastic Modulus: | 29000 | ksi |
| Design Moment ($M_u$): | 2884.4 | k-ft |
| Nominal Moment Capacity ($\phi_B M_n$): | 4571.5 | k-ft - ACI318-005 - 10.2 |
| $M_u/\phi_B M_n$: | 0.63 | Result: OK |
| Design Shear ($V_u$): | 309.6 | k |
| Nominal Shear Capacity ($\phi_V V_n$): | 456.5 | k - ACI318-05 - 11.3.1.1 or 11.5.7.2 |
| $V_u/\phi_V V_n$: | 0.68 | Result: OK |
| Design Tension ($T_u$): | 0.0 | k |
| Nominal Tension Capacity ($\phi_T T_n$): | 1769.0 | k - ACI318-05 - 10.2 |
| $T_u/\phi_T T_n$: | 0.00 | Result: OK |
| Design Compression ($P_u$): | 96.5 | k |
| Nominal Compression Capacity ($\phi_P P_n$): | 8390.2 | k - ACI318-05 - 10.3.6.2 |
| $P_u/\phi_P P_n$: | 0.01 | Result: OK |
| Bending Reinforcement Ratio: | 0.007 | ACI318-05 - 10.8.4 & 10.9.1 |
| | | |
| $M_u/\phi_B M_n + T_u/\phi_T T_n$: | 0.63 | Result: OK |


Design Factored Shear / Depth
-400
-300
-200
-100
0
100
0
-5
-10
-15
-20
-25
-30
Depth (ft)
Shear (k)


Design Factored Moment / Depth
0
1000
2000
3000
4000
0
-5
-10
-15
-20
-25
-30
Depth (ft)
Moment (k-ft)


Nominal and Factored Moment Capacity and Factored Design Loads
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
15000
10000
5000
0
-5000
Axial (kip)
Moment (k-ft)
Pu & Mu
Tu & Mu
Factored Envelope
Nominal Envelope